Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Journal of the Society of Arts.

FRIDAY, MAY 14, 1869.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at eight o'clock:—

May 19.—"On the Progress of the Colonies." By John Robinson, Esq., of Natal. On this evening Sir George Grey, K.C.B., late Governor-General of New Zealand, will preside.

May 26.—*Derby-day.*—No Meeting.

Committee on India.

Conferences are now in course of being held for the discussion of various subjects connected with India.

The following arrangements have been made for the remaining two conferences:—

This Evening (Friday), May 14.—"Waste Lands." By George Campbell, Esq.

Friday Evening, May 28.—"Trade with Central Asia, Thibet, and South-Western China."

At these Meetings the chair will be taken at 8 o'clock, and the discussion will be opened by a paper.

Members of the Society interested in Indian questions are invited to attend.

Postal Reform Committee.

The Council have appointed a Committee for the purpose of "promoting the adoption of reduced rates of postage, particularly in reference to printed matter and parcels," and that Committee is now engaged in the consideration of the question, with a view to secure newspapers and printed matter being carried at rates not higher than those which are found practicable in France, Belgium, and the United States of America.

The Committee met on the 3rd inst., and in accordance with its recommendations, communications are being sent to the proprietors of the principal London newspapers, to the Religious and Charitable Societies, and to the Chambers of Commerce, inviting their co-operation.

Communications are also being sent to Foreign Governments, asking for information as to the postal regulations in their respective countries, especially relating to newspapers, printed matter, and small parcels.

Cab Reform.

The Council will appoint a day after the Whitsuntide holidays for discussing any practical measures for improving the cab system in the metropolis.

Any persons who may desire to submit proposals for discussion are requested to communicate them in writing to the Secretary on or before Saturday, the 29th inst.

Designs for Channel Steamers.

The Council of the Society of Arts offer the Gold Medal of the Society, and the large Silver Medal of the Society, for the best and the second-best block model of a steamer, which shall afford the most convenient shelter and accommodation to passengers on the deck of the vessel *crossing the* Channel between France and England. The steamer is not to exceed in tonnage and draught the best vessels now in use between Folkestone and Boulogne, and the model must be on a scale of a quarter of an inch to a foot. The models, marked in cypher, are to be sent in to the Society of Arts' House, John-street, Adelphi, on or before the 1st November next, with a sealed envelope, giving the name and address of the designer.

The Council reserve the right of withholding either or both medals, in case, in their opinion, the models sent in do not possess sufficient merit.

The following particulars of the South-Eastern Channel steamers, *Victoria, Albert Edward,* and *Alexandra,* are given for the convenience of competitors, but it is not intended to confine the designs to them, except as to tonnage and draught:—

Length between perpendiculars, 200 ft.
Breadth of beam, 24 ft.
Depth underside of deck amidships, 12 ft. 6 in.
Draught of water, 7 ft.
Bow, clipper.
Stern, elliptic.
Rig, polacca with two masts, lug foresail, gaff mainsail, staysail, and flying jib.
Engines, oscillating.
Paddle wheels, 17 ft. 6 in. diameter.
Tonnage, 568 tons.
Speed, 17 miles an hour.

Notice to Institutions.

A limited number of copies of the following works by Sir George Ramsay, Bart., has been kindly placed by the author at the disposal of the Society, for distribution to such Institutions as may apply for them:—

1. Analysis and Theory of the Emotions.
2. Introduction to Mental Philosophy.
3. Principles of Psychology.
4. Instinct and Reason.
5. Essay on the Distribution of Wealth.
6. Political Discourses.
7. A Disquisition on Government.

Applications for copies should be made to the Secretary of the Society of Arts.

THAMES EMBANKMENT COMMITTEE.

The proceedings of this Committee, so far as they relate to the question of the site for the Law Courts, have been reprinted in the form of a pamphlet, which may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden, price threepence.

SUBSCRIPTIONS.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

◆

FOOD COMMITTEE.

A meeting of this Committee was held on Wednesday afternoon, 21st April, at which there were present—Mr. Benjamin Shaw (in the chair), Mr. James A. Youl, Rev. J. E. Hall, Mr. G. F. Wilson, F.R.S., and Mr. Phillips Bevan.

Mr. **Augustus Morris**, of Sydney, attended by invitation to explain his views with regard to the preservation of meat, for exportation to long distances, by the process of refrigeration.

The **Chairman** having requested Mr. Morris to favour the Committee with any statement he had to bring before them,

Mr. **Morris** said unfortunately he had very little to communicate, inasmuch as the persons with whom he was associated in Australia, had not been able to make experiments beyond those which were recorded in the public newspapers in Sydney. By the last accounts he had received from Australia, they were then making all preparations, and great confidence was expressed that the plan that had been adopted would be successful, viz., freezing by the compression and expansion of air. Mr. Thomas Mort had gone to an expense of at least £5,000 in preparing the machinery and apparatus for bringing the meat to this country, but he had not yet practically tested the apparatus. No person had ever devoted himself more earnestly, or in a more liberal spirit, to solve a question of great public utility. He feared it would be found that the process itself was scarcely practicable, and any way was far too expensive, though his friends in Sydney thought differently, and that the expense would not be prejudicial to the undertaking. It was estimated by authorities in this country that, by the process referred to, it would require a ton of coals to produce an amount of refrigeration equal to a ton of ice. The meat having been frozen before it was put on board ship, the operation of freezing would not, in the opinion of his friends, require to be repeated very often during the passage; while he thought that operation would require to be repeated every second day at least, because, however well protected by non-conductors the meat tanks might be, the loss by radiation and otherwise would be great. He had lately been engaged in experiments with an apparatus invented by Mr. Rees Reece.

The **Chairman** inquired whether that was the invention referred to by Dr. Paul*, in a paper lately read by that gentleman before the Society.

Mr. **Morris** replied it was described in that paper. He had had great hopes that the machine would have proved eminently successful, but he was not yet in a position to say that it had realised his expectations. The inventor himself was, however, still unwavering in his faith as to its ultimately proving a great success. He (Mr. Morris) was unable to detect any fault in the theory, and yet hoped, when its practical working was better understood, that the inventor's perseverance would be rewarded by complete success.

The **Chairman** understood that difficulties arose from want of sufficient closeness of the joints.

Mr. **Morris** said there was no practical difficulty about that. The greatest pressure that would be brought upon the machine, even in the tropics, was not more than 200 lbs. to the square inch, and there was no mechanical difficulty in making it to sustain 1,500 lbs. or 2,000 lbs. to the inch.

The **Chairman** asked whether the cost of the freezing process would not absorb all the profits likely to accrue from the undertaking?

Mr. **Morris** replied that the question resolved itself into the quantity of coal which would be required on a voyage from Australia. On that account he thought that, sooner or later, some process in which ammonia was the freezing agent would be adopted. He still trusted that Mr. Reece's apparatus would solve the question. Although 200 lbs. pressure to the square inch, under the ammonia process, might appear excessive, yet his friends, Messrs. Mort and Nicolle, proposed to compress air 300 lbs. to the square inch. It was merely a question of mechanical strength.

The **Chairman** apprehended it came to this; there was the question of expense in the first place, and the mechanical difficulty in the second place.

Mr. **Morris** stated that several scientific men and engineers had inspected Mr. Reece's apparatus, and none had been able to find out any theoretical objections to it. They all agreed as to the imperfect construction of the machine, which was not in all its parts calculated to bear high pressure. Much had to be learned as to the relative proportions of the different parts, but, although the apparatus was not, in its present form, properly adjusted, yet a fair trial of it might be obtained. Notwithstanding many delays and difficulties, he yet hoped all would turn out well.

The **Chairman** said the Committee would be glad to hear Mr. Morris's views with regard to the effect that was produced upon frozen meat, so far as his experience of it went.

Mr. **Morris**, on that point, could state that the experience of himself and his friends, with meat frozen in tin vessels, impervious to the atmosphere and external moisture, extended over fourteen months. The meat had been frozen at from 10° Fahrenheit to as low as 47° below zero. No change whatever took place in the flavour of the meat or in its appearance. A single drop of blood would be as distinct and clear after many months as if it had been just put on.

Mr. **Bevan** inquired what were the effects of a sudden unfreezing of the meat?

Mr. **Morris** replied he had never done it suddenly; if it could be done, he apprehended it would have a prejudicial effect upon the meat. The thawing must be gradually effected, by the meat being hung in a safe or other place till it was reduced to the temperature of the atmosphere; and his experience was, that it would remain good as long as fresh meat from the butcher. He had kept meat hung up in the air from three to fourteen days after it was taken out of the case in which it had been frozen, and, when cooked, it was fresh and sound. He had sent frozen meat to Melbourne, packed in saw-dust, the same as ice was packed here, and, when cooked eight and ten days afterwards, it was perfectly sound and well flavoured. No decomposition whatever took place on the thawing, any more than in ordinary fresh meat, so long as the freezing was effected by transmission of heat, and not by contact with ice at a low temperature. In Canada and Russia, so long as the cold was very intense, and there was no moisture in the air or from the ice, the meat retained its flavour, but, as soon as a thaw set in, beef, mutton, and poultry were scarcely distinguishable. At at temperature of about 60° it would take about 30 hours for a large joint of meat to become thawed through. In Canada and Russia, in winter time, the thawing of the meat was effected in water, at an artificial temperature. In Sydney, in the month of September, which was about equal to April in this country, meat had been kept for a fortnight (after it had been taken out of the place where it had been frozen) in the ordinary atmosphere. It might have been cooked after 30 hours without injury to the meat. After the thawing, meat assumed the condition and appearance of that which had not been frozen.

---

* *Journal*, present vol., p. 67.

Rev. J. E. Hall gathered from Mr. Morris's statement that frozen meat did not decompose more quickly than meat which had not been frozen.

Mr. Morris said this was quite correct, as far as his own experience went. He knew the general opinion was that frozen meat would not keep good as long as other meat. Sir J. Young, during the last two years he was in Sydney, often sent his poultry and meat to the place where the freezing experiments were made, and it was kept frozen for two or three months. He thought it improved the flavour of the meat. He (Mr. Morris) did not go so far as that; his own opinion was that there was little or no difference in the meat. It certainly did not alter the character of the meat. If a tough piece of meat was frozen, it came out tough; if tender, it remained so. There was really no change in the meat.

The Chairman suggested that it would be very desirable if Mr. Morris would be kind enough to communicate to the committee, in his own words, what were the difficulties which delayed the carrying out of the system to which he had directed his attention; and, if they were printed in the *Journal*, they would come under the notice of engineers and scientific men, who might be able to point out a remedy.

Mr. Youl understood Mr. Morris to say the inventor was still sanguine of success.

Mr. Morris said it was so, but the results had not as yet been such as to enable him to give a decided opinion. Mr. Reece seemed to be able to overcome the difficulties as they arose, and his confidence was unshaken as to the soundness of the principle of his invention. The great thing to be done was to produce the refrigeration cheaply.

The Chairman suggested that the publication of the difficulties hitherto met with was probably the best way of getting a solution of the difficulties.

Mr. Morris remarked that he was afraid, after all the attention he had paid to this most important subject, he should have to return to Australia with his work unfinished. The inventor and himself had been working from month to month, confident of ultimate success. He (Mr. Morris) had consulted scientific men, and they really could say nothing against the accuracy of the theory, which justified the expectations he had formed.

Mr. Youl inquired how many experiments with the apparatus Mr. Morris had seen?

Mr. Morris replied, a great many. At times the working of the apparatus seemed to indicate the production of 15 to 16 tons of ice for every ton of coal consumed, but, from some mechanical defect, no complete experiment had been made. He was satisfied in his own mind that the freezing process was the only practicable plan of bringing large quanties of fresh meat from Australia and the River Plate, and he had no doubt apparatus suitable for the purpose would eventually be produced. He might state that scarcely a day passed that some method of preserving meat was not brought under his notice; but, with the exception of the tinned meats and salted meat, not one of them was of any practical value as regarded Australia.

The Chairman remarked that if the production of a refrigerating atmosphere came to be a question of cost, and if the process had to be repeated from time to time on the passage, the shorter passage from South America, as compared with Australia, would be a material consideration in the matter,

Mr. Morris observed that sailing ships would perform the passage from Australia as quickly as they would from the Plate.

Mr. Bevan suggested whether a modification of the old condensing air apparatus, used in the ventilation of mines, would not be applicable in this case, instead of going through repeated processes of freezing during the voyage.

Mr. Morris said the plan adopted by Messrs. Mort and Nicolle, in Australia, for compressing the air, was similar to that employed for compressing the air in the cutting of the Mont Cenis Tunnel, and that was done by hydraulics. The same air was used over and over again. If they used fresh air every time, as in mining, it would be a very expensive operation indeed. It had been suggested by those connected with Australia, that the government should offer a large premium, say £40,000 or £50,000, to any person who successfully accomplished the economical transit of fresh meat in large quantities from the colonies to England. He believed that suggestion would be carried out. A contribution of 10s. per thousand sheep, and £2 per thousand cattle in all the Australasian colonies, would raise £40,000. He thought some substantial reward like that would be the best means of getting the question solved. He would have the reward placed at such a figure as would be an attraction to eminent scientific men in Europe to take up the subject, and thoroughly carry it out. He suggested that it was a matter which could best be carried out by an association, inasmuch as individuals were unwilling to bear the great cost of carrying on experiments, however feasible they might appear to be. He felt satisfied that the only practical plan of bringing meat from Australia and South America, was under some modification of the refrigerating idea, whatever might be the particular process adopted. He did not imagine that, under any system, the expense of bringing the meat over in a frozen state ought to exceed 1d. per lb., including freight.

The Chairman asked Mr. Morris whether he thought that meat could compete with the article exported by the Ramornie Company.

Mr. Morris replied that in Australia they might safely calculate upon getting meat at 1½d. per lb., and the refuse of the animals—the skin of the sheep, the hides of the cattle, and offal fat—would quite pay the cost of preparing the meat, and putting it on board ship in a frozen state. He believed the meat could be brought over and sold wholesale here at 4d. per lb. But it was to be recollected that meat from Australia would compete, not with the low qualities here, but with the best meat; and the reason why the tinned meats arriving from Australia were so good was because the original quality was far superior to the generality of meat in England.

Mr. G. F. Wilson inquired how long the mechanical difficulties referred to by Mr. Morris had been discovered?

Mr. Morris replied during the last month or two. The inventor only regarded them as temporary hindrances.

The Chairman thanked Mr. Morris on behalf of the Committee for the information he had given them, and requested him to favour them with any further information he might acquire on the subject, previous to his departure for Australia.

The Committee then adjourned.

Mr. Morris, under date 1st May, writes as follows:—

"Since giving my evidence before the Food Committee, a further trial of Mr. Reece's apparatus has been made, and the result proved that, in continuous action, it would make, in 24 hours, 36 cwt. of ice, consuming during the operation not more than 3cwt. of coals, or at the rate of 12 tons of ice for one ton of fuel. This result was obtained from a solution containing not more than 15 per cent. of ammonia. Had the solution been of the proper strength, and were the different parts of the apparatus adjusted as experience points out, I cannot but think that Mr. Reece's machine would produce results 40 or 50 per cent. greater. I think the Society would give a great encouragement to those who are trying to work out the animal food question, if it would appoint some competent scientific gentlemen to report on Mr. Reece's apparatus, and its suitability for maintaining on ship-board the requisite degree of cold."

PISCICULTURAL COMMITTEE.

A meeting of this Committee took place on Friday, May 7th, JAMES CAIRD, Esq., in the chair. The following members of the Committee were also present:—Messrs. G. W. Hart, Harry Lobb, Frank Buckland, Henry Lee, James A. Youl, H. Cholmondeley Pennell. The paper read was—

ON OYSTER CULTURE AND LEGISLATION.

BY A. FRANCIS PENNELL, ESQ.

The paper to which I ask the attention of the Piscicultural Committee this evening, is upon the subject of oyster culture and legislation. In treating this question, which is, however, a very wide one, I have endeavoured to confine myself strictly within the scope of the objects of the Committee, which are, as I understand them, the diffusion of knowledge, with a view to the adoption of measures calculated to promote practically the welfare and preservation of our fisheries. The preamble of an old Act of Parliament recites "that the maintenance and preserving of the fisheries of the kingdom is a great national object." With the increasing difficulty of finding an adequate food-supply for the people, this object, in a national point of view, has certainly not lost in interest, whilst the scarcity of oysters—almost amounting to famine—now existing in England, gives it special importance at the present time.

It has been said that he was a bold man who first swallowed an oyster; but, since this deed of daring, all oyster-eaters have borne witness to their highly nutritious qualities, and to their beneficial effects both in health and sickness. So far as can be ascertained, oysters have, from a remote period, been a most popular article of consumption, and, until late years, they have been produced in sufficient abundance to be sold at prices which brought them within reach of all classes. Now, however, an entire change has taken place, and an oyster is one of the most expensive of luxuries, and the greatest scarcity prevails at present. I believe I considerably understate the falling off in the supply, when I say that the quantity of oysters sent to market in 1868 was less than one-fourth of the annual quantity sent twenty years ago. The present prices give some indication of the change. Prior to 1861, the wholesale price of the best natives was £2 2s. a bushel; since then the price has risen rapidly to £4 4s. in 1865, in 1866 to £5, and during the past season they reached the prohibitive price of £8 a bushel, having thus risen nearly 300 per cent. in eight years; or, to descend to particulars, they have risen from less than ½d. to nearly 2d. each.

I now propose to treat of the causes which have led to this unfortunate result, and which are in themselves suggestive of the remedies to be applied—and in the first place it will be necessary to refer to the laws affecting oyster fisheries. Until the last thirty years, the statute-book contained but few laws upon the subject, but since 1839 they have received a good deal of attention. In that year a convention (which subsequently received the confirmation of Parliament) was negociated with France, applying to the seas between the two countries. Its chief provisions, as regards oysters, were the establishment of a close time from 1st May to 31st August, and the prohibition of the removal of oysters of a less diameter than 2½ inches, together with the arrangements necessary for the enforcement of these provisions. Besides these general regulations, and those established by the "Convention Amendment Act" of 1855, our own public beds have been variously regulated by numerous and conflicting Orders in Council.

To add to the complexity, in several cases where beds existed in the vicinity of large towns, the inhabitants—recognising the necessity of restrictions to prevent their destruction—obtained private Acts of Parliament, empowering them to regulate the beds according to their varying local requirements, and confining their working to the fishermen of the place, who had thus a strong personal interest in their welfare. It had from the first been doubtful whether the restrictions under the French convention applied to the fisheries within three miles of our coasts; and the various enactments subsequently passed at length resulted in such a hopeless confusion, that neither those who had to administer the laws, nor those who had to obey them, knew what was or what was not intended to be their practical operation. This state of things gave rise to much practical inconvenience and many complaints, until at length the government carried the "Oyster and Mussel Fisheries Act" of 1866, which again was repealed and re-enacted in the "Sea Fisheries Act" of 1868. Under this last Act all the restrictive rules previously in force on public fisheries have been entirely abolished, the only exception being that the Act confirmed a new convention with France, which establishes a close time for the Channel from the 16th June to 31st August, but does away with the previous limit of the minimum size under which oysters might not be removed. The convention, however, applies only to the beds situated outside the territorial seas; so that at the present time, upon all our public beds which are within three miles of the coast, the fishing is entirely free and unrestricted all the year round.

I would now draw attention to the practical results which immediately followed this crude legislation, in beds which had been previously maintained in a prosperous condition by the restrictions enforced; and I will take the case of Milford Haven as an illustration. Until the year 1866, the dredgermen here were prevented, under a local Act, from removing oysters of a less diameter than 2¼ inches; a five months close time—from the 1st May to 30th September—was enforced, and strangers were excluded. By these means a fair stock of parent oysters was maintained, and the men were able to earn a decent livelihood, although the price was only 16s. a thousand; and, that only the large or marketable oysters might be sold, the small ones were picked out and thrown back upon the beds. Since then the fishery has rapidly deteriorated, and, although the men sell every oyster they catch, however small, and they are obtaining 28s. a thousand, yet many of the men and their families are in great distress. The number of oysters of all sizes caught this season was only half the number usually obtained in a season before the removal of the restrictions. Even in its present state, the Milford fishery is one of the least exhausted of our public beds; and, if prompt measures are adopted for the re-imposition of the previously existing restrictions, it might, with others similarly situated, be saved from complete ruin. And what is the condition of our other public fisheries, as, for instance, the beds at the Mumbles, off Tenby, at Falmouth, at Studlands, in Pool Harbour, those near the Isle of Wight and at Langston, and last, the magnificent fisheries in the estuary of the Thames on the Essex and Kent coasts, where alone the true native is produced? I am afraid of each and all it must be admitted that they have been dredged to the verge of exhaustion, and that the number of parent oysters remaining is now so small that, even if no more were removed, years must elapse before the reproductive process could replenish them to any considerable extent. The recent legislation, however, cannot in fairness be held responsible to any large extent for the condition to which our beds have been reduced, which has been, in most cases, the result of previous persistent neglect; but so far as the removal of the restrictions has had any practical operation, that operation has been injurious.

Turning from our own neglected beds to those of France, we might, from the genius of the country, naturally expect to see there the beneficial results of a full code regulating the fisheries. This expectation, however, would be signally disappointed, in proof of which I will, with the Committee's permission, read a short passage from a book written by M. Rothschild, and which has received the official sanction of M. Coste, the Inspector-General of the French fisheries:—

"The seas washing the coast of France were once extraordinarily rich in oyster beds, and these beds were of such large size as to be measured by miles. Cancale, St. Brieux, Granville, La Rochelle, Marennes, Arcachon, all these places were the classic grounds of the oysters. And now? St. Brieux is destroyed. Happily it has been re-stocked. Brest is dredged out; so are the rivers of Brittany. Cancale and Granville are *bien malades*. Ile de Rhé, Oberon, Marennes, La Rochelle, Rochefort, mourn the loss of 18 out of 23 beds which once constituted their riches."

The writer, after adverting to all the different enemies of the oyster—dog-whelks, five-fingered star-fish, cold, heat, mud, and sand, sums up by saying that to none of these is the depletion of the beds attributable, but to the unrestricted dredging (*exploitation commune*) which has been permitted. Having last year inspected all the fisheries mentioned, and having received from the local officers the fullest official information, I can vouch for the accuracy of M. Rothschild's description, and for the opinion universally held, that their depletion has been caused by over-dredging. I should, however, add that the attempt to re-habilitate St. Brieux, by using artificial collectors, has since proved a complete failure. The rapid deterioration of their beds roused the French Government to a perception of the necessity of protecting them by legislative action, and, accordingly, a complete code of oyster laws has been at length established, with the means necessary for enforcing them—a point in which we have always lamentably failed. The beds, however, have already suffered so much, that years must elapse before they can recover their former prosperous condition.

As the instances I have mentioned afford a warning illustrative of the effect of unrestricted freedom of dredging, I will now mention one or two cases in which the beneficial results of following an opposite course are strikingly apparent. Near Herne Bay a grant of a considerable area of waste ground was made to a public company in 1864. According to the concurrent testimony given before a Parliamentary Committee by numerous local and official witnesses, this once favourite breeding ground had become, from over-dredging, a complete waste, and would for ever have remained so, unless stocked with parent oysters and cultivated. This the company have done on a very large scale, and the result has been, that not only has a certain quantity of young oysters been produced every year, but during the last season the fall of spat was so exceptionally good, that dredging operations have necessarily been suspended for fear of destroying the young brood. Had this fall of spat taken place on an unprotected ground, there can be little doubt that ere this nine-tenths of it would have been destroyed by dredging, as has been the case in the Swale and other localities.

As bearing upon the argument adduced in this paper, it is noteworthy that the quantity of spat on the Herne Bay ground is in exact ratio to the quantity of parent stock; where the parent oysters are laid thickly, there the young brood has been produced in *proportionate* abundance, and where the parent oysters are few, the brood is equally scarce.

The concession of barren ground to the Roach River Company has, I believe, been followed by equally favourable results. The pernicious effects of over-dredging, and, conversely, the beneficial effects of rest, where the bed is not subject to destruction by mud, have been conclusively exhibited in two other instances which have come under my own observation, the one in England, and the other in France. An oyster-bed near Studlands Bay, in Dorsetshire, had been dredged out and forsaken about 40 years ago. Shortly before I visited it, in 1867, it had been re-discovered, and a rich harvest of oysters of all ages was found upon it, greatly to the profit and advantage of the first discoverers. The other instance is that of the Cancale bed, once the largest and most important in France. It appears from official statistics furnished to the French Government that, from 1800 to 1815, the necessities of the great war with England produced such a drain upon the fishermen as *practically* to leave the beds in a state of repose. At the conclusion of the war, an immense stock of oysters was found to have accumulated, in some places a yard deep; this rich field at once afforded occupation to numbers of the discharged sailors, and the annual quantity dredged for market was immediately quadrupled, and, with the growing demand, greater quantities were taken each year, till, in 1847, the maximum of 71,000,000 oysters in one year was reached. This great drain on the bed proved to be beyond its recuperative powers, and the stock steadily declined till, when I visited it last year, three oysters only were caught in two hours' dredging. Facts like these, confirmed by official evidence, surely read us a lesson we cannot afford to overlook.

Our English Act of 1866, which has proved so mischievous in certain respects, contained, however, some valuable sections, enabling the Board of Trade to make grants of exclusive rights of oyster-fishing to persons or companies who might wish to embark in oyster-culture. The wisdom of these provisions is sufficiently evidenced by the success already achieved by the Herne Bay and Roach River Companies, to whom grants of this description have been made. The only cause for regret is that the process for obtaining a grant is such as practically to exclude the fishermen themselves, except in a corporate form, from the benefit of the Act.

I will now advert to that portion of the report of the Sea Fisheries Commission which formed the basis of the present law, under which all restrictions have been abolished. No one can doubt the great abilities and scientific knowledge possessed by the gentlemen who composed the Commission, and I can only attribute the mistaken, and in its effect most mischievous, conclusion at which they arrived, so far as oysters are concerned, to the fact that the practical element was not sufficiently represented, and that the true facts of the case and their bearings were not brought before them in a tangible form. The Commissioners' principal argument is based on the assertion that the present scarcity is solely caused by the oysters themselves having failed to breed since 1861 or 1862, and by this means they avoid the otherwise inevitable conclusion that the scarcity has been caused by the denuded state of the beds. And, further, they assume that an oyster produces 800,000 at a birth, and of these they also assume, without proof, that about 10,000 will survive and come to maturity, and that, therefore, those remaining after the closest practicable dredging are sufficient for the replenishment of the beds. It must be admitted, however, even on their own showing, that this assumption is a violent one, for the Commissioners proceed to remark of the young oysters, that they are surrounded "with changes of temperature, with gales of wind, with the multitudes of marine animals which prey upon the oyster-spat in all its stages, or with the currents which, by being a little swifter or a little slower than usual, or by deviating a few points from their ordinary course, may carry millions of nascent oysters upon sands or mud unfitted for their development." As a matter of fact, experience has conclusively shown that the number surviving on open beds is infinitesimally small, probably not averaging more than three or four to each parent oyster, which are all that can be counted upon in the open beds in average seasons.

And now with regard to the other equally important argument, upon the truth or otherwise of which the whole value of the Commissioners' recommendations depend, viz., the alleged failure of oysters to breed. Now, what are the facts of the case? I have already incidentally mentioned circumstances disproving the alleged failure, and here is a statement of the foreman of the Whitstable Company, given by him in evidence, and showing the amount of brood actually purchased from English beds each year by that company, all of it since the time of the alleged failure, viz.:—

In 1861 2,	79,000	wash	of brood, cost	£35,000
1862–3,	12,836	„	„	8,450
1864–5,	2,842	„	„	3,003
1865–6,	9,939	„	„	11,676

Total quantity of brood purchased since the alleged failure, 104,617 wash, cost £58,129. The other Thames companies have bought in the same proportion. Again, in the case of the magnificent Blackwater fisheries, the official report on them states that, in 1867, full four years after the commencement of the alleged failure, for every mature oyster eight immatured or brood oysters were found. I have myself visited many fisheries during the last five years, and on each and all of them I have found spat of all ages, in small quantities no doubt, but still quite as much as the decreased numbers of the parent stock could be expected, in ordinary breeding seasons, to produce. Did time permit, I would adduce further evidence of the fallacy of the arguments upon which our present laws are based, but I believe this is unnecessary, as almost all practical men are agreed upon the subject.

To guard against misconception, I should observe that the true state of the case appears to me to be, that every year spat is produced, but that, in certain years, exceptionally heavy falls take place, such as those of 1858 and 1859. Our knowledge of all the circumstances and conditions affecting the oyster is not yet sufficiently advanced to teach what are *all* the essentials for a good fall of spat, and if we did know them we might be unable to control or provide for them. There are, however, two essentials which we do know and can provide for—these are, a fair stock of parent oysters, and clean substances for the spat to adhere to, essentials which, when observed, have produced the desired results.

And now, in conclusion, I think the foregoing examples and observations have sufficiently indicated the course our oyster legislation should take, and I will conclude this paper by stating the following propositions, in which I have embodied the leading principles which I conceive should govern that legislation:—

1. That to prevent the exhaustion of the beds, and to ensure the maintenance of a stock of parent oysters, a minimum size should be fixed, under which oysters should not be removed.
2. That except in the case of beds with a peculiarly muddy bottom, a close time should also be enforced, as is the case in France, Spain, Ireland, and, little as we might have expected it, in America.
3. That, in order to accomplish the above, authority should be given to the Board of Trade to make well considered bye-laws, for the regulation of the different public beds, according to their varying local requirements, thus carrying out the principle adopted in salmon rivers.
4. That, as in Ireland and other countries, the local authorities (police coast-guard and revenue cruisers) should assist, when required, in the enforcement of the bye-laws.
5. That the public beds should only be worked by persons having a strong and direct personal interest in their preservation and proper cultivation, and that therefore only the dredgermen of the vicinity should be allowed to work them. This system has been found very beneficial in France. With us, whenever a bed begins to thrive, the dredgermen from all parts of the coast come down *en masse*, and clear off every oyster, great and small.
6. That every facility should be given for obtaining oyster-fishery grants, under the recent Act, in all cases where an increased supply of oysters is likely to follow.
7. The government should exercise, by means of a general Fishery Board, or other arrangement, a closer supervision over all our sea-fisheries, and especially oyster-beds. In France there are no less than thirty-seven fishery-officers, with numerous subordinates, whose sole duties consist in the supervision of the fisheries. Considering the value and importance to England of her sea-fisheries, it would appear hardly credible that we should have only one officer charged with the care of them.

In conclusion, I will only observe that the question to which I have invited the attention of this Committee is eminently a practical one, and must be governed by and take its form from the results of actual experience. I have appealed to the experience of this country, of Ireland, and to that of France, Spain, and even America. The same concurrent testimony is borne by all these countries as to the mischievous effects of over-dredging, and the necessity of a close time. We cannot afford to overlook this universal experience of the old world and the new, and to mis-read the lessons they teach us, the result, in some cases, of long and very dear-bought experience. We cannot afford to rest our practical legislation upon a mere theory as to the number of young an oyster produces, and the number escaping a general wreck. We must fall back upon the common-sense principles—the homely and every day experience—that, other conditions being equal, the number of young must necessarily be governed by the number of the parent stock. We must remember, also, that the question is one on which the means of subsistence of a large industrial population is depending, and that therefore it is doubly incumbent upon us to tread upon safe ground. I venture to suggest to the Committee that a deputation should wait upon the government, to press upon them the necessity of prompt legislation in the manner I have indicated.

DISCUSSION.

Mr. G. W. Hart said that, in 1865, he visited France and saw there a very flourishing condition of oyster culture. He was so encouraged that he determined to attempt the same thing in England. There was nothing here to prevent a similar success. The existing circumstances were the same here as in France. We had the same clean bottom upon London clay, and under that chalk. He believed the only thing in which he was wanting at his ponds, at Hayling Island, was a control of the temperature. However, the result of his labours was a success, as could be seen by the formation and advancement of the South of England Oyster Company. In 1866 they obtained from 50,000 oysters two million of spat, and this, too, when they were novices, and did not know how to manage matters. Again, when they put down six hundred thousand, the result was about one hundred million. Unfortunately for the Company, the banks which they had built were not sufficiently strong, so that one of them gave way, and a great loss was the result. They had, nevertheless, £3,000 in hard cash, and that spoke for itself. It must be remembered that that place never produced an oyster before. This year they expected even a better return. There was one thing that should be remembered, as it went rather against Mr. Buckland's theory of heat. At the place he was speaking of they had two ponds, to all intents and purposes exactly alike. In 1867, one of these ponds produced plentifully, while the other was comparatively barren; but the strange thing was, that the pond which produced nothing in 1867, produced plentifully in 1868, while the one that was successful in 1867, gave nothing in 1868, and this under precisely the same conditions. He was quite at a loss as to what cause this should be attributed. The only thing he could think of was that, owing to the great temperature of last year, there had been an immense growth of weed, which might probably have destroyed a number of the young oysters. The tides, too, fell off considerably that year, the spring floods were only equal to about an average neap tide, and that might probably have something to do with this peculiar result. He was sorry to say that London had not yet profited by his labours at Hayling. He had sent all he could to France, where he had learnt the method of culture he was practising. He hoped, however, to have some ready this year for the London market. There could be but little doubt that Mr. Buckland was right as regards temperature, but he must not make temperature his all in all. Temperature was not the only thing by any means; the chief thing was perfect cleanliness. It was not well to delude themselves with the idea that because there was a large amount of spat there would be a large quantity of oysters. It was much the same as with an orchard. Every spring the blossoms came forth, but it did not follow that every blossom would become an apple. It must not be supposed that because two millions of spat were produced in one year, that we were going to have two millions of oysters. From his experience he could say that only about one or two per cent. was the proportion to be relied upon to breed from. It generally took three or four days' fruitless effort to get up an oyster with spat upon it. He believed that the reason for this waste would be found in the fact—at least, he conceived it to be a fact —that the oyster, like the hen, could not contain its ova longer than a certain time, and that therefore vast numbers were liberated before they were in a fit state to encounter their adversaries. As to dredging, that should only be allowed under certain conditions. Ultimately the ground would get so that it could keep itself clean. The tide was sufficient to keep it in a state of perfect cleanliness. Of course, restrictions on dredging might not be possible in muddy rivers, such as the Essex rivers. What was true of those rivers was not true of the Solent, and it would, therefore, be unwise to have general legislation. The local fishers should have the power to make bye-laws. The fisheries should belong to the fishermen on the shores. As soon as there was a fall of oysters in the Solent, the Essex men came down with different dredgers, and took away the oysters for the benefit of the Essex and Kent rivers. This, it must be observed, referred to the Solent Harbour, and should not be allowed. With regard to the French fisheries, the cause of their falling off was very simple; it was not owing to any defect in the system, it was owing to the bad management of the fishers themselves. A man went down in 1863, and put in a large quantity of breeding oysters, and got a good result in 1864; he repeated the process in that year, and then, in 1865, could not catch the oysters he wanted because they were covered over with another lot. Then again, they had not kept their water clean, but had been sitting down smoking their pipes, and counting their eggs before they were hatched. Oysters would not come up on a dirty stone. His opinion was that it was entirely through dirtiness that the French fisheries had failed.

Mr. **Frank Buckland** said that one great object of the Piscicultural Committee had been met that evening, in the interchange of ideas on the cultivation of our fish. On a subject like the one at present under consideration, it was almost necessary that there should be diversity of opinion. Whatever might be done or said, something or other would be sure to turn up to upset any theories with regard to that most mysterious and uncommunicative creature, the oyster. His friends and himself had found out a great many important facts by simply watching the little creature. From his experience, he must say that he disagreed with his friend Mr. Pennell on the subject of dredging. He had used hard words when speaking of the Royal Commissioners and the conclusion they arrived at. Those gentlemen were men of science and judgment, and it could not be believed that they came to the conclusion they had without much thought and upon good grounds. To his last life's blood he (Mr. Buckland) would set his face against Mr. Pennell's ideas on over-dredging. He would not say that, in some instances, it did not affect the small oysters, but he was convinced that, as a rule, millions and millions died soon after they were cast from their mothers' shell, on account of there being no safe resting-place for them. In the summer months he had seen a glass of water taken from the sea, and it was filled with spat, and yet there were none on the ground. The young oysters would not stick unless the conditions were such as suited them. These conditions were two—heat and tranquillity. With regard to the first, it would perhaps be as well to modify it, and say warmth, because over-heat might kill the young oysters. This condition had been disputed, but if the facts were looked at prudently they would substantiate his theory. Where, he asked, were there found the most oysters in the world? Why, in hot climates. Then, again, they must have quietness. The least movement sent them flying away. With regard to dredging, the secret of the scarcity of oysters was not to be found in the dredge. He objected to Mr. Pennell's observations on that point. Mr. Pennell had said he could produce many practical men who would support his view. That might be so, but he thought Mr. Pennell must be mistaken, as he (Mr. Buckland) knew a great number of oyster-breeders who would tell a very different story. Mr. Pennell had recommended legislation. He (Mr. Buckland) had had a good deal to do with legislation upon such questions, and he should most certainly say, not yet; we were unfit for it at present, and could not stand the cross-examination of a Committee. In conclusion, he wished to mention that the gentleman who sat beside him, Professor Mobuis, had made the tour of the oyster-fisheries of France, and had now arrived here to make a tour of those of this country. He trusted that the gentlemen present would offer him every assistance in their power.

Mr. **F. Wiseman** (Paglesham) said he disagreed with Mr. Pennell's opinion that the oyster scarcity was to be attributed to dredging. He had last year expressed his opinion upon the subject in a letter to *Land and Water*, and he saw no reason for changing that opinion. He quite agreed with Mr. Buckland that a high temperature was a desideratum. Here was an example in proof of this. The temperature of a well known river in Essex was, on June 10th, 1866, 72°, which was considered very favourable for the expected spat, the weather having been very hot for six days previously. This high temperature was followed by a frosty night, and on the morning of the 11th the temperature of the river was 62°, having gone down 10° in one night. The temperature continued to decrease until it got down to 58°. If the hot weather had continued there would have been abundance of spat. What was wanted during the spatting months was an even temperature. Before that time he had seen 140 spat upon one empty oyster shell, but after that time it was difficult to find one spat upon 140 shells. It had been urged that the scarcity of spat was owing to the scarcity of parent oysters, but when it was remembered that one oyster alone was supposed to produce 800,000, at first sight it might sound plausible. Such, however, was not the case. Where he resided there was an abundance of oysters and oyster brood on the beds, up to June, 1860, the produce of the great fall of spat in 1858 and 1859, and previous years, and yet, in 1860, with all that stock, there was not one spat seen in Essex or Kent. Surely there was no failure in this case for the want of parent oysters. Besides, it was a well-known fact, that although the Whitstable and Herne Bay Companies had an enormous quantity of oysters, yet they had less spat than was found in Essex. He felt confident that the scarcity was not ascribable to a want of parent oysters or to over-dredging; it was simply temperature.

Mr. HARRY LOBB said that the discussion very much reminded him of the quarrel in the fable as to the colour of the chameleon. For his own part, he agreed with every word Mr. Pennell had said. What he (Mr. Lobb) had laid before the Society on two previous occasions, together with later information, had been summed up by Mr. Pennell in his paper. It was well known that in England and France dredging had been going on to an enormous extent. The demand for oysters had been and was enormously increasing, and the supply had not been at all adequate; the result was, dredging had been going on, and, so to speak, the goose had been destroyed for the sake of the golden eggs. Perhaps the only fault to be found in Mr. Pennell's paper was that he did not give sufficient credit to what had been done at Arcachon. The results there, which he himself had seen, were, indeed, very remarkable, and he believed these results were brought about by leaving the bed unmolested. He had been told once, when there was a boat in quarantine, that during the time the flag was flying no dredging was allowed, and that when the flag was lowered the oysters were so thick that it was dangerous to mention numbers. With all due deference to the remarks that had been made, he was convinced that 20 per cent. could be saved if the spat were protected. The other recommendations which Mr. Pennell had suggested were most valuable, all of which he hoped would be attended to. He (Mr. Lobb) could not agree with Mr. Buckland regarding over-dredging; he believed it was decidedly injurious. The mass of evidence produced before the Commissioners was very defective. The Commissioners were, no doubt, very excellent gentlemen, but they had not studied the question practically. With regard to the remarks of Mr. Wiseman, it must be remembered that they were applicable only to a certain place, and did not apply to the Solent and other places where they had sea water.

Mr. CHOLMONDELEY PENNELL said that he did not know whether he did wisely in becoming a speaker instead of remaining a listener; but, as the letter of M. Souberron had specially referred to him, he thought it proper to say a few words. He had been accredited by the English government to the French government, to ascertain the state of the French fisheries, and the latter goverment had afforded him every facility; perhaps there were few men who had been placed in the same position with regard to the French fisheries as he had. He knew, therefore, that his information was accurate, and could not delude himself into the idea that his conclusions were incorrect. He entertained the greatest respect for the opinions of other gentlemen, but he failed to see how anyone could obtain better information on the subject than he had been able to obtain, from the position he occupied. He would be glad to be shown that his ideas on the subject were wrong. Hitherto, every attempt to prove his conclusions to be wrong had been in defiance of fair argument. No such thing as a comparison between the produce and expenditure had yet been shown. The result of investigation in France had shown that, up to the present time, the tile system throughout the coast of France had been a commercial failure. With regard to the other questions before the Committee, his hands were tied. His official position precluded him from taking further part in the discussion.

Mr. WOODS said that as facts were perhaps more valuable than theories, he would state that Mr. Tomlin had, in one-fifth of an acre, laid down 340 oysters, and that the result had been 300,000 spat.

Mr. J. A. YOUL would merely add a few words of encouragement. He hoped that nothing which had fallen from Mr. Pennell would in any way detract from the cultivation of a most wonderful, beautiful, and mysterious fish. He believed that the two things Mr. Buckland had mentioned were indeed elements of success. The peculiar phenomenon with regard to the two ponds alluded to by Mr. Hart was indeed very strange; but a similar thing was found with regard to the breeding of salmon; no doubt there were some reasons for it, and perhaps, if they were found out, it would lead to the discovery of the cause of the non-success of both oyster and salmon culture.

In reply to a question by a gentleman present,

Mr. HART said that none of the oysters from his ponds had yet been in the food market, but they had been sent to France for the purpose of cultivation. They had spatted oysters in July, 1866 and 1867, and they would be brought to London during the present season.

The CHAIRMAN, in closing the discussion, observed that there was one thing upon which they would all agree, and that was that the paper and the discussion were both of great interest. Certainly, Mr. Pennell had not spared her Majesty's Commission, of which he (Mr. Caird) had the honour of being chairman, yet he had listened to those criticisms with all the respect due to one who had carefully considered the subject. That Commission was composed of some of the most distinguished men of the present day—Professor Huxley, for instance—but Mr. Pennell seemed to imagin e there was a scarcity of practical men. If, however, any one would take the trouble to look into the Blue-book, and notice the mass of evidence therein, he would be convinced that the Commission had obtained the best evidence it was in their power to get. Perhaps the correctness of the opinion they arrived at might be disputed; but, at any rate, they had no prejudice. From what had passed at that meeting, he was inclined to think that the additional experience they had had, for the five years that the Commission had been in existence, could not be expected to give satisfaction to all parties, when during that discussion there had not been unanimity amongst any of the individuals who had spoken. As Commissioners, they weighed the evidence that was laid before them, and they endeavoured to do so without any prejudice whatever. They had come to the conclusion that it was better to leave the public beds alone, and that every protection should be given to those who employed their capital on private beds. These were the results they had come to, and from what he had heard at the meeting, he did not see that it was possible for them to arrive at any other decision. He believed that was the view taken on the subject, and he hoped it would continue to be so. He was sorry to hear from Mr. Cholmondeley Pennell that the culture of oysters, as far as regarded the tile system, had entirely failed. If that remark applied to the whole of the French system, it would be a bad thing for us. With abundance of protection in France, the result had been no better it seemed —nay, even worse—than in England with free trade. Although he was, therefore, in favour of this English freedom, yet he thought that, when an individual brought his capital, and cultivated on beds where other people might come and get the oysters, or, in fact, use his capital, then it was right for the law to step in and protect that individual. There were yet a great many very important things to find out. It was only by steps, slow but yet certain, that we could arrive at a proper conclusion. We were hardly ready yet to go to government to ask them to legislate upon the matter.

Mr. PENNELL, in reply, said that he was very glad the Chairman had exonerated him from having expressed, with any undue strength, the opinions he held. The discussion having turned chiefly on artificial oyster-culture, with which his paper did not deal, he need not long detain the Committee, nor did he think it necessary to give the results of his own experience in artificial breeding. With regard to the depletion of the French fisheries, his observations had referred solely to the natural beds, and not in any way to the results obtained under the new system of cultivating oysters on the foreshores, by means of artificial "collectors." Neither the results of the artificial system of England nor that of France affected his conclusions, which had reference solely to the great natural beds. He was glad to see that the Committee generally concurred in his views, and although Mr. Buckland did not attribute the scarcity of oysters to over-dredging, his opinion was unsupported by any proofs or arguments, and as he (Mr. Buckland) had already begun to change his heat theory, he might hope that next year he would come to the views he (Mr. Pennell) had expressed in his paper.

The following communication on the oyster beds of Arcachon, from Dr. J. Léon Souberron, Secretary of the Société Impériale d'Acclimatation, and Professor of l'Ecole de Pharmacie, was read:—

The imperial beds were made in 1860, under the direction of Professor Coste, in the basin of Arcachon, where they occupy an area of 26 hectares, divided into three beds, Grand Lès (ten hectares), Crastorbe (twelve hectares), and Lahillon (four hectares). They were made in places where oysters already existed, but in very small numbers, as at Crastorbe or at Grand Lès, or upon entirely exhausted grounds, as at Lahillon, and they began to produce oysters in 1862.[*] On the 1st January, 1868, the beds contained 34,000,000 oysters, that is to say, more than all the rest of the basin, distributed as follows:—

Grand Lès	15,000,000
Crastorbe......................	10,000,000
Lahillon	9,000,000
	34,000,000

The navy has been supplied, since the beds were made, with 14,311,102 oysters, of about the value of 111,000 francs. 100,000 saleable oysters, of the size 0·05 metre, make a cubic metre, weighing 2,800 kilogrammes; 148 cubic metres, weighing 103,600 kilogrammes, having been removed. Besides the oysters supplied to the navy, a certain quantity have disappeared from the bed, owing to the ravages of the dog whelk (*murex erinaceus*), and the effects of extreme temperatures.

The borers, which are found especially in the neighbourhood of collectors, and which destroy in a very short time a quantity of oysters, make their nest in a heap, near the old oysters. No mercy is shown by them. In 1867, 17,699 of these creatures, and 519 of their nests were destroyed. The separation of the young oysters (*detroquage*), which is necessary at a certain period, to allow an equal development of the oysters, which, without this operation, would inconvenience each other in their growth, is the cause of the loss of a certain number of oysters, a loss which is estimated at a tenth on an average; but since hydraulic lime has been substituted for ordinary cement for covering the tiles, this loss has been much diminished. M. Dauré's plan for placing wounded oysters in closed metallic tile cases, thus protecting them from the attacks of such enemies as crabs, small mollusca, &c., also much lessens the loss from separation (*detroquage*). The cold, which before the winter of 1867 had caused the death of about 3,000,000 oysters, continued its ravages in 1868. The temperature was so low that portions of the bottom (*crassats*) uncovered at spring-tides looked like small icebergs, and the consequence was that entire hectares perished. Then came heat, which was not in the least prejudicial (the temperature rose to 40° in the shade upon the *crassats*). The loss for the year 1868 was estimated at 10,000,000 oysters.

The navy that year was to have been supplied with 4,750,000 oysters, a number greater than *the entire basin* furnished, which was estimated to have produced 3,216,320 oysters, sold at the rate of 3,000 francs a million. To meet the orders which were received, it would have been necessary to dispose of all the saleable oysters, and even to furnish a certain quantity of less size than ·05m. in diameter. Such orders are evidently too heavy, and if they be continued the beds will be exhausted, though up to this time they have produced sufficient for the supply, but they are not inexhaustible; nevertheless, the navy has just forbidden the sale of oysters under ·05m. in size. It would be also desirable to stop the moving of breeding oysters before the 15th of March, so as not to subject the animals to the fatigue of the voyage, just as their organism was preparing for reproduction. Disappointments would thus be avoided, as those of Tremblade and the Mediterranean.

At the present time, in consequence of the above causes, there are now only remaining *in the Imperial* beds 12,000,000 oysters, of a size of from ·02m. to ·07m., besides 15,000 breeding oysters, which must be kept at any price; their loss would be irreparable. If these breeding oysters are taken, it would be like killing the goose for the golden egg.

To counteract the unfavourable effects of bad years to the spat, and the result of over-dredging, it has been proposed, and wisely so, in our opinion, to suspend taking the oysters for three years. For if the season of 1869 be productive, the brood not being separated till 1872, there will not be much loss from this operation, and this brood will almost completely effect the stocking of the oyster beds; if, on the contrary, 1869 be unproductive, as was the summer of 1868, there still will be time to hope that in 1872 there will be a better result, in not being obliged to separate the oysters at too young an age. The production of spat in the Arcachon Basin, which was small in 1867, in consequence of the severe storms which prevailed in the months of July and August, has been nothing, in consequence of extreme heat, excepting in the Imperial bed of Lahillon, the real breeding place, where 750 tiles have furnished 795,000 young oysters, and whose total produce is valued at 200,000 oysters. This year, in the Imperial beds, 200,000 tiles have been placed, covered with hydraulic lime, 5,000 tubes similarly covered, and 400 hurdles, half of which only were prepared with lime. The production has been:—

	1865.	1866.	1867.	1868.
Grand-Lès	5,890,000	700,000	200,000	..
Crastorbe ..	1,834,000	20,000	20,000	..
Lahillon ..	6,000,000	2,500,000	900,000	2,000,000
Total....	13,724,000	3,220,000	1,120,000	2,000,000

In the Arcachon Basin there are 116 grants, occupying an area of 370 hectares. Some of these grants are very renumerative (certain persons who have them acknowledge a net receipt of 1,000 to 1,500 francs the hectare annually). A few only give a moderate or bad result, but that may be attributed to faults in their management. Since new grants have been made on the tidal bottoms of Lahillon, round the Imperial bed, which is the centre for re-stocking all the beds, which receive in part a great quantity of spat from the breeding oysters, these grants have answered, to those who have money to make the necessary outlay for the management of the beds, and who are on the spot and can exercise an active superintendence. At oyster beds, the master's eye is indispensable.

The production is generally less there than in the Imperial beds, but it is much greater when the practice of the Imperial beds is followed. The results must become better as soon as more grants are made. For the clearing operations, on a larger and larger scale, will, in the same proportion, clear the basin from star-fish, destructive to young or old oysters, and will diminish the increase of *Murex erinaceus* (dog-whelk). Mud kills all in the basin, therefore dredging the channel is desirable; it will increase its healthiness, and allow a large amount of oysters to be secured; but this can only be done by the State whose property the channel is.

---

[*] The Report on the Oyster Culture at Arcachon, presented to the Société d'Acclimatation, the 29th December, 1865, should be consulted (*Bulletin de la Soc. Imp. d'Acclim.*, 2nd Serie, iii, p. 1, 1866.)

The results obtained in the Imperial beds have given a fresh impetus to the breeding of oysters; and oyster-culture, which was the monopoly of the State in the basin, has become more general during the last few years. Unfortunately, there was no increase in 1868; this frightened several proprietors, and they sold their grants, when, by a little perseverance, they might have had a remunerative return. On the other side, we regret to say, the idea of granting beds has been thought of—that is to say, special beds for the fishermen. It has been thought that this system will give greater facilities to the fishermen to guarantee their existence. But it has not been taken into account that the time when the beds require more particularly the care of the fishermen is when the fishery gives the greatest profits to the fisher, who is not disposed to sacrifice the means of realising money directly to the improvement of his bed, which will be only profitable at a certain time. It must be acknowledged that oyster-culture and fishery cannot be carried on at the same time. The establishment of small parks, to different proprietors, around large concessions, is the better plan, for each grant is surrounded by several small beds, on which the proprietors, not being able generally to look after their oysters at the proper time, leave them without care, or more frequently sell them, without attention to the conditions of their contract with the government. Moreover, certain amongst them are accused of robbing the neighbouring beds during the night, and of having organised the pillage of them.

Oyster-culture is not getting on badly at Arcachon, and it will get over some of those vicissitudes which are sure to be met with in all human undertakings. We were much astonished to read, in the reports on the "Oyster and Mussel Fisheries of France, with the applicability of the French system to British waters," by Cholmondeley Pennell, Esq., Inspector of oyster fisheries, that oyster-culture in France is dead or dying. We cannot explain what this gentleman means, unless he was informed about the beds by persons who were not in a position, as those who had the management of them would be, to tell him the facts. We cannot in particular accept Mr. Pennell's definition of the natural and artificial culture of oysters, which, according to him, do not differ; for, in the latter case, use is made of earthen collectors, which are not employed in the former.

In our opinion, the culture so-called natural, that is to say, cleaning the surface of the beds and depositing there, at a favourable time, a sufficient quantity of oysters for breeding, placing stones and shells to receive the spat, does not differ from the so-called artificial oyster-culture. Moreover, it is an undeniable fact, that the above care was not taken in the Arcachon basin, till M. Coste made known his process of culture.

An objection is made to the tiles being too dear, and it is said their cost is not covered by what is produced; but if that be true, how can it be explained that the people who have the grants, have asked permission to place round the Lahillon beds 100,000 tiles, to receive the spat on them, and then to remove it into their own beds, and, on the other side, at Lahillon, in 1865, 7,500 tiles produced 1,500,000 spat, of the value, in three years, at a saleable age, of about 50,000 francs; the cost of the tiles was about 400 francs, which appears to us a very satisfactory result. Another fact in favour of tiles is, that the government has ordered to be given to the fishermen who have the grant, several thousand of these tiles covered with spat. The average quantity of spat on the tiles in 1867, a bad year, was forty oysters; in 1866, a better year, three hundred on the tiles at the bottom, and twenty-eight on those at the top of the *ruches* (piles of tiles).

We cannot believe in the difficulty of cleaning the tiles, inasmuch as, before using them to receive the fresh spat, they must be covered with a coating of cement, which makes them like new.

As to the practice which some persons have of ceasing to use the tiles in their beds, as their agreement obliges them, the conclusion is that it is prompted by their negligence in placing them entirely covered by the tide, instead of so as to be out of water at spring tides, which gives marine organisms the opportunity of fixing themselves, and taking the place of the spat. We must remember that the only place where spat was found in 1868 was the bed of Lahillon, where true artificial culture is carried on, and where 2,000,000 young oysters were gathered. All this shows that the persons who informed Mr. Pennell gave him wrong facts, and we regret that he was not able to consult the official documents, which would have been communicated to him with the same liberality as to ourselves, and would have proved that oyster culture is not to be despaired of.

We must also remark that the process called English by Mr. Pennell, which consists in cultivating the spat in closed reservoirs, has been in use here for several years, in the *claies* (screens) at Marennes by M. Coste, at Règneville, by Mdlle. S. Felix, and by M. C. De Greny in Bretagne.

TWENTY-SECOND ORDINARY MEETING.

Wednesday, May 12th, 1869; Earl DUCIE in the chair.

The following candidates were proposed for election as members of the Society:—

Black, John Thomas, 9, Adelaide-road, N.W.
Broadwood, Walter Stewart, 3, Queen's-gate-gardens, South Kensington, W.
Couch, Enos, 172, High-street, Wapping, E.
Hart, G. W., Hayling Island, Hants.
Lacey, John, 4, Wellington-street, London-bridge, S.E.
Lange, Daniel A., 21, Regent-street, S.W.
Pamphilon, Frederick W., 5, John-street, Adelphi, W.C.
Ramsden, J. C., Little Horton-lane, Bradford, Yorkshire.
Robinson, Edwin, 76, Worship-street, E.C.
Yapp, George, 172, Oakley-street, Chelsea, S.W.
Young, John, 35, King-street, Cheapside, E.C.
Young, William, 47, Hemingford-road, Barnsbury, N.

The following candidates were balloted for, and duly elected members of the Society:—

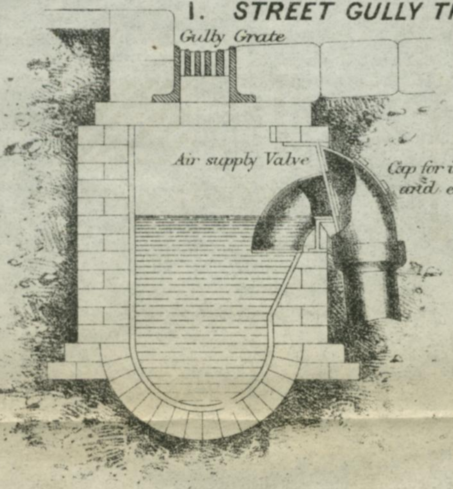
Barnard, Clement, 2, Staple-inn, Holborn, W.C.
Beadel, Frederick, 25, Gresham-street, E.C., and Gidea-hall, Romford, Essex.
Brogden, Jas., Tondu-house, Bridgend, Glamorganshire.
Bunbury, Sir Charles J. F., Bart., F.R.S., Burton-hall, Bury St. Edmunds, and 48, Eaton-place, S.W.
Burch, Sampson Kingsford, 239, Vauxhall-bridge-road, S.W.
Burke, William Henry, 17, Newman-street, Oxford-street, W.
Cather, Rev. Robert G., LL.D., 8, Old Jewry, E.C.
Chatto, W. J. P., 23, Carlton-house-terrace, S.W.
Church, Jabez, Hamlet-house, Chelmsford.
Clarke, Rev. C. Pickering, M.A., 3, Adelaide-street, Strand, W.C.
Clarke, Joseph, 2, Earl's-court-road, Kensington, W.
Clarke, Robert G., 3, St. Alban's-road, Highgate-road, N.W.
Clover, Joseph Thomas, 3, Cavendish-place, Cavendish-square, W.
Clow, Leonard, 9, Fitzroy-street, Fitzroy-square, W.
Corderoy, George, 17, King William-street, Strand, W.C.
Corrie, J. M., 42, Lancaster-gate, W.
Crespin, Edgar, 28, Torrington-square, W.C.

THE FOLLOWING DIAG

Shew some of the Traps referred to in Mr. LOVE

Ventilation & Trapping of House Drains as effe

1. STREET GULLY TRAP.

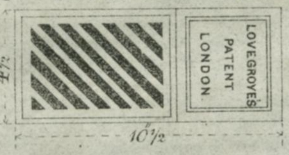


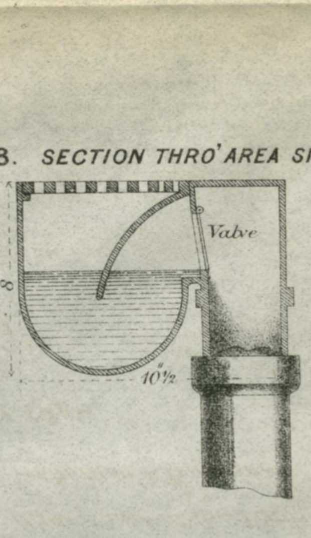
This trap converts the Gully into a down cast Shaft, supplying fresh air into the Sewer & also prevents the Sewer from being obstructed with road detritus.

2. STREET

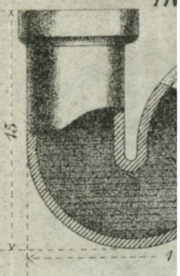
3. SECTION THRO' AREA SINK.

3. PLAN OF AREA SINK.





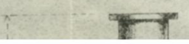
SINK TRAP ADAP IN



6. SECTION THRO' GARDEN SINK.

6. PLAN SHEWING IRON GRID IN GARDEN SINKS.

7. TRAP FOR WASTE WATER PIPE LARGER FOR KITCHEN SINKS



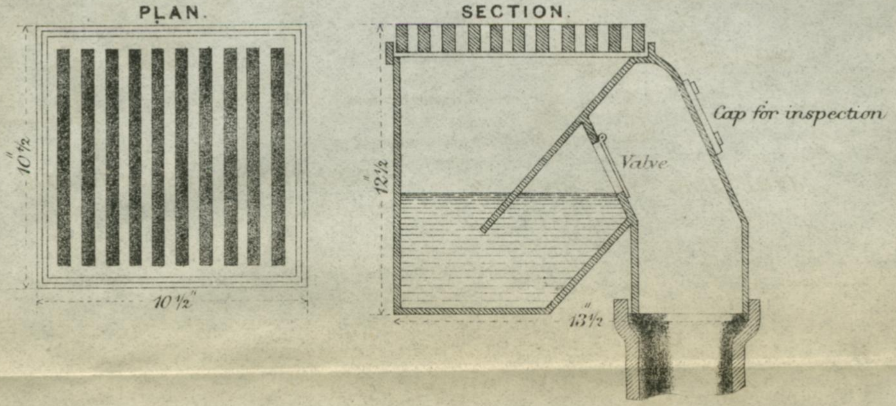
VING DIAGRAMS

ed to in Mr. LOVECROVE'S Paper on the

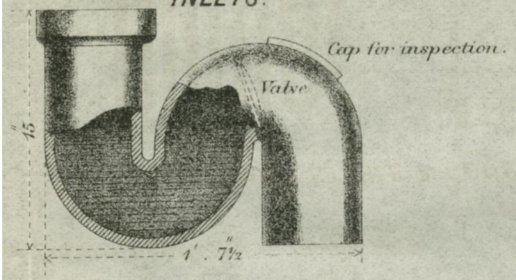
e Drains as effective in their action!

a
h air
he
ith

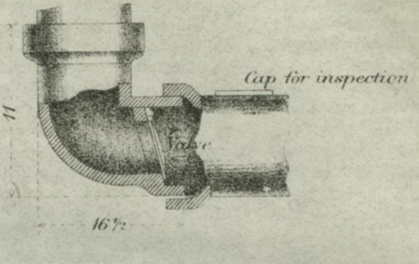
2. STREET, PARK, STABLE & COURT GULLY TRAPS.



4. SINK TRAP ADAPTED FOR EXISTING INLETS.

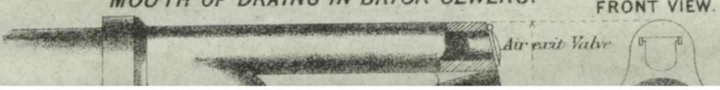


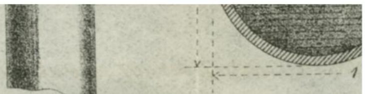
5. RAIN PIPE SHOE TRAP.



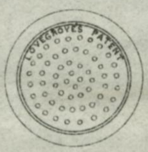
7. WASTE WATER PIPES. FOR KITCHEN SINKS.

8. DRAIN OUTLET VALVE TRAP, FOR MOUTH OF DRAINS IN BRICK SEWERS.

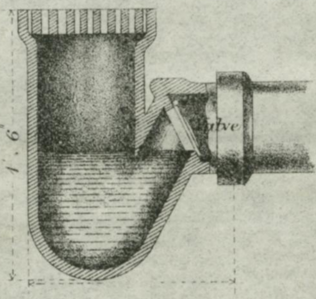




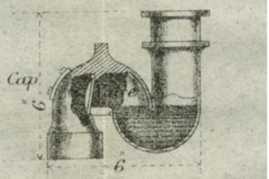
6.
PLAN SHEWING IRON
GRID IN GARDEN SINKS.



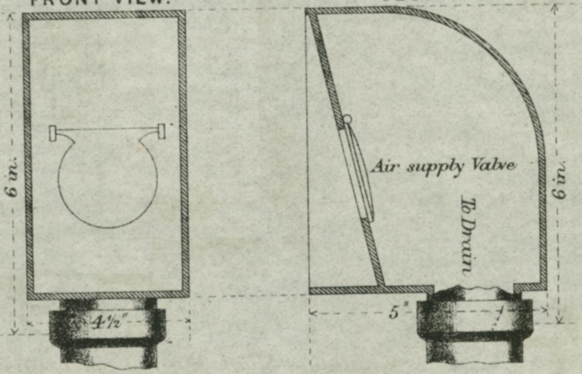
6. SECTION THRO' GARDEN SINK.



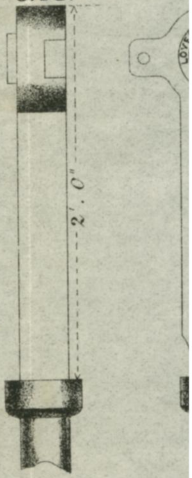
7.
TRAP FOR WASTE WATER PIPE
LARGER FOR KITCHEN SINKS



9.
AIR SUPPLY BOX TO WORK IN WITH A WALL.


FRONT VIEW.
SECTION.

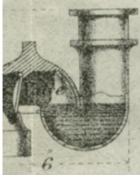
10. AIR SUPP


SIDE.
F

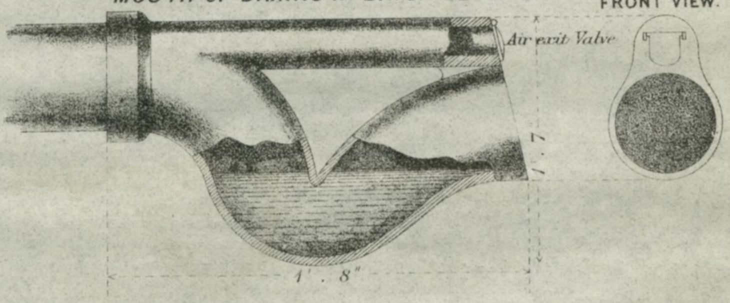
N.B. The above are made by Mr GEORGE JENNINGS, Sanitary Engineer, Stangate, L

KELL BROS LITHO. CASTLE ST HOL

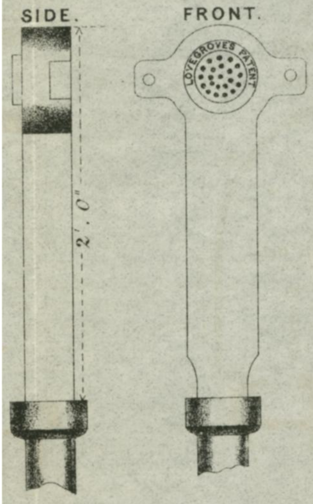
7.
WASTE WATER PIPES.
FOR KITCHEN SINKS.

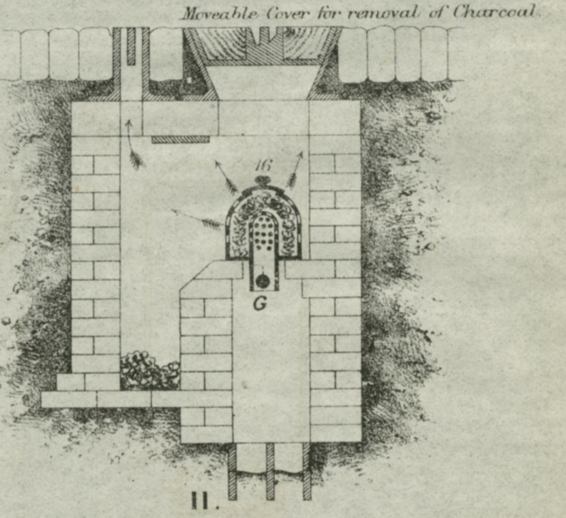


8.
DRAIN OUTLET VALVE TRAP, FOR
MOUTH OF DRAINS IN BRICK SEWERS.



10. AIR SUPPLY POST.





11.

Ventilating Shaft shewing application of disinfecting Charcoal Box for Sewer ventilation.
The overflow trapped by Lovegrove's Patent at **G**.

ineer, Stangate, Lambeth, S.E.

JAMES LOVEGROVE, C.E. Surveyor,
Town Hall, Hackney, N.E.

ITHO. CASTLE ST HOLBORN. E.C.

Firth, James, 27, Shepperton-cottages, Islington, N.
Hackforth, Henry, 9, Bentinck-street, Manchester-square, W.
Vivian, William, Roehampton-lodge, Roehampton, and 51, Bow-lane, E.C.

The Paper read was—

ON THE VENTILATION AND TRAPPING OF DRAINS.

By James Lovegrove, Esq., Assoc. Inst. C.E.

The subject embraces the ventilation of drains, the trapping of gullies, and the various modes adopted for preventing sewer air passing out of gully and drain inlets.

The author of this paper has been led to attach considerable importance to the subject of drain ventilation, in consequence of having, in many instances, observed in houses where sanitary works had been carried out a larger amount of effluvia after the execution of drainage works than existed before. He therefore purposes, in order that the subject may be fully and fairly put before the Society, to refer to the various means by which sewage matter has hitherto been conveyed from houses; to notice the effect upon the air in drains of discharging sewage matter into them; to suggest a new mode of ventilation; and also to consider the means usually employed to prevent the escape of sewer-air through gully and drain inlets.

Some twenty or thirty years ago, public sewers were permitted to receive waste and refuse waters only, the closet drainage being carried into cesspools. The wash-house sink discharged the waste on to the surface of the back yard, by a pipe which passed through a hole in the external wall; the other waste water flowed along an uncovered drain beneath the floor of the house, and thence over the surface of the footway into the side channel of the street, so that, at all times during the day, a dirty stream of sewage might have been seen flowing along the channel. The exhalations from the uncovered cesspool, from the soaked and saturated materials of the uncovered drain, and from the exposed stream of sewage in the street, were most offensive. A covered sewer along such a street was next introduced. Gradually, covered drains were constructed beneath the houses, and connected with the new sewer, but with untrapped inlets, and untrapped gullies were also formed in the street channels, to carry off the surface water. Thousands of cesspools were next connected with the sewer by overflow drains, and these allowed the effluvia therefrom to escape through the inlet opening, and caused a nuisance as great, or nearly so, as existed under the original state of things.

The next step was that of abolishing cesspools, and fixing pan-inlets, in direct connection with the drain leading into the sewer. The result was, that although the nuisance arising from the cesspools had been removed, the effluvium escaping through the untrapped drains and gullies was increased tenfold. The cesspool had been a long-standing abomination before the water-closet was thought of as the readiest way of getting rid of the nuisance. But this remedy, though so universally adopted, should be regarded by all as one of a palliative character only, as it not only causes the pollution of our rivers, but requires more than half the water supply to keep the closets clean. It is, however, hoped that modes of collecting the excreta and the most valuable portion of town sewage, without destroying their valuable properties, will, ere long, be introduced, and that the sewers will simply be put to their original use of receiving waste and refuse waters only. The dry earth closet may be a step in the right direction, and should receive a fair trial, in spite of the few difficulties which have to be met with at the outset.

In inquiring into the causes of air currents, either from or within drains, it is suggested that the variable flow of sewage has a powerful influence on the air within the drain, whilst that produced by rainfall has still greater, and the variations of temperature are another cause of displacement and renewal of drain air. The Table shows a series of observations taken at the outlets of drains, at the point of connection with the sewer. They were taken by Biram's anemometer, and the results show that up and down currents of air are constantly passing to and fro. Whenever an up-current issues through a drain opening, it must be manifest that some of the inlets of such drains are untrapped, and, therefore, sewer air must be escaping through such untrapped inlets, to the danger of those who reside in the house. In the construction of gully inlets there are two principles which should be strictly observed, viz.:—

No. of observations.	No. and sizes of drains.					Velocity in feet in five minutes.		Ingress or egress.	Remarks.
	18 inches.	15 inches.	12 inches.	9 inches.	6 inches.	Minimum.	Maximum.		
170	...	...	...	27	...	50	200	ingress	
	...	...	...	1	...	...	1,000	ingress	
	...	...	...	1	...	...	1,650	ingress	
	...	...	...	14	...	50	100	egress	
	...	...	...	1	..	...	250	egress	
	...	...	...	1	...	...	400	egress	
	...	...	...	125	...	...	...	...	quiet
48	...	...	...	...	11	50	100	ingress	
	...	...	...	...	8	50	1,600	egress	
	...	...	...	...	29	...	...	...	quiet
12	...	...	2	...	...	50	50	ingress	
	...	...	2	...	...	100	100	egress	
	...	...	8	...	...	...	...	...	quiet
8	...	2	...	...	...	50	100	ingress	
	...	1	...	...	...	...	150	egress	
	...	5	...	...	...	...	...	...	quiet

1. To prevent, as far as practicable, the entry of road detritus into the sewer.

2. To prevent the escape of sewer air through the inlet.

Various methods have been adopted. Twenty different forms of traps in general use are all dependent on being constantly charged with water, and may be easily proved to be inefficient for the purposes for which they were designed, and for these reasons should be condemned. The sewer air is separated from the atmosphere by the ½-inch of water, or at the most an inch, and a few days' dry weather is sufficient to untrap most of the gully inlets, as the water quickly evaporates to below the syphon dip. This evaporation is aided, in many cases, by the absorbing power of the materials with which the inlets are constructed, and also by matters falling into them. These gully traps are often fixed in a narrow street close to the open doors and windows of the houses, and are it is feared, in many instances, the cause of much ill-health. Traps constructed on this principle have been observed by the author in an untrapped condition, in Derby, Leicester, Windsor, and other places. Another form of trap, largely used for street gullies in the metropolis, is known as the shackle-flap, sometimes fixed at the end of a twelve or fifteen-inch length of pipe, and sometimes in the form of a square block. The flap and its seating form two plain metallic surfaces, and it therefore does not admit of partial separation of the surfaces, as the smallest possible opening made by the overflowing water separates the surface throughout, so that, while the water is flowing through the lower part of the valve, the sewer air escapes through the upper part. The flaps are sometimes fixed at the point of connection with the sewer; their action has been tested where thus fixed. A lighted candle has been held at the sides of the flap during the passage of water through the gully, and a strong current of sewer air was found passing through the upper part of the flap during the period of flow. The system[*] adopted by the author is constructed on the two principles hereinbefore mentioned, and forms a combination of the syphon-dip and shackle-flap. It is made in two forms; one form having the appearance of a bent tube, nearly semicircular in shape, and inserted so that one end of the tube, called the syphon-dip, dips into the cesspit beneath the gully grating, and the other discharges into the outlet, the valve-flap being fixed within the tube. The other form is that of an oblong block of stoneware, having a six-inch opening formed diagonally through it, so that the valve on the outlet side is from one to two inches higher than the opening in the block on the cesspit side, both on the same principle, but in different form. The syphon-dip prevents the escape of sewer air through the upper part of the shackle-flap during the period of flow, and the flap resists the upward pressure of the sewer air, thus effectually sealing the inlet. The pressure of the sewer air within assists in closing the flap, whilst the pressure on the inner face by the atmosphere opens the flap, and allows a refreshing current of air to pass into the sewer. This current is generally so strong as almost to blow out the light when placed near to the flap, and should be maintained, but so as not to admit of the escape of sewer air.[†]

The escape of sewer air into houses gave rise to the adoption of various forms of traps. For drain inlets, I believe the first trap used was the dip-trap—a brick cesspit formed usually about eighteen inches square and six inches below the drain, the inlet on one side being separated from the outlet on the other side by a division of stone, slate, of iron, made to dip about an inch into the water of the drain. The well-known common syphon was an improvement on the old dip-trap for the main line of drain, and in a ventilated drain these are efficient, inasmuch as, from one source or another, they are always charged with water. This form of trap is used by the author in combination with an air tube and valve, the latter acting as a ventilator. The principle of the water-dip has been put into various forms for drain inlets, but they all are dependent on a very small thickness of water for their action, and are quickly untrapped by evaporation, and then the result is precisely the same as if there were no trap at all. The common bell-trap is more frequently met with than any other form of trap. The mere film of water at the rim of the inverted bell is supposed to prevent sewer air passing through, but, generally speaking when the sewers are in the most foul condition, that is, in the summer season, the required film of water is not in the trap, and it then forms a sewer ventilator. A piece of house-flannel, cotton, or other similar matter entering the bell-trap inlets, will often hang partly in the bell basin and partly out, and, by syphonic action, quickly draw off the water to a level below the rim of the inverted bell. These traps exist in almost every house, and are the cause of a large amount of illness. These remarks are applicable to all the forms of trap dependent on a constant film of water for their action, which are, consequently, not reliable. The following examples have occurred in the author's practice:—At a nobleman's residence in Leicestershire, the smell of sewer air was perceptible throughout the bedroom floor. The closet appeared to be well constructed, and a very good apparatus fixed; the walls were cased with mahogany panelling, beautifully polished; but the smell was intolerable. The flame of a taper, applied to the top edge of the casing, indicated a strong current of air, also at several open joints in the wood-work. The casing was removed, when a 4-inch lead waste-pipe, leading from the cistern, and having a syphon-dip, was exposed. The pipe passed through an opening, much too large for its size, cut in the side wall, and thence into the cistern. The flame of the candle indicated that a strong current of air passed into the closet through this opening, and by the waste-pipe into an ante-chamber, and thence into the bedroom. The syphon was then pierced with an awl at the lowest point, and the candle-flame applied, when the current of air, passing through the perforation proved the syphon perfectly dry. The water-mark of the cistern showed distinctly that no water had reached the top of the waste-pipe for months. The waste-pipe was at once removed, and an overflow-pipe fixed, to discharge on to the roof gutter, in lieu thereof. Smells also arose from a number of dry bell-traps around the house; these were removed, and improved traps fixed in their place. The drain was also ventilated by means of an iron pipe, carried to a height of about 40 feet, and a supply of air obtained by fixing an air-supply valve near the outlet of the drain. These measures effectually prevented any smell escaping into the house. Another case was that of a house situated in Moorgate-street, City, the basement being occupied by the housekeeper as a living-room. On examination, the drain was ascertained to be in direct communication with the sewer, with a common bell-trap, which was dry, in the front area; another dry trap in the back kitchen, in the centre of the stone floor, giving out a strong current of sewer air; the raised sink had the usual bell-trap, but the bell was off. The effluvia arising from these sources passed up the staircase, also through several defective portions of the plastered ceiling, and corrupted the air of the whole house. On the upper floors of this house there were two water-closets, a lavatory, and a urinal, each discharging, by three separate branches, into a 4-in. vertical soil-pipe let into the wall. The lavatory basin emptied itself through an inch lead pipe, 20 inches in length, bent so as to form a trap. But when either of the water-closets was worked, the water in this trap was drawn off. The plumber had been again and again, and persisted in asserting that all was perfectly correct. Notwithstanding the plumber's statement, all was wrong. The bell-trap of the lavatory on the top floor was acted on in the same way. In this case, the author had the old brick-drain taken up, a pipe-drain laid down, and improved traps fixed to the sink-inlets. The sewer air was shut off by fixing a trap near the outlet, and the drain ventilated by means of an inch tube passed above roof height, and at a point remote from the chimney. An air-supply valve was fixed so as to produce a through current of air within the drain.

In a public hospital, near Portman-square, a brick-drain in direct connection with the sewer, passed sewer-air inwards so strongly as to blow out the flame of a candle. This drain continued through the building, and received in its way the raised sink-inlets, also the drainage from the lavatories, sinks, and water-closets on the upper floor. In this case, when water was passed from one or other of the inlets, it caused the contained air first to press against the water in the inlet water-traps, and, on reaction, to draw off sufficient water to untrap the inlet. Thus, through one or other of the inlets, air was generally escaping into the house.

At a large house in Piccadilly, the town residence of a nobleman's family, there were no less than 17 sink-inlets distributed about the basement, in the area, passages, and paved rooms. Ten out of the 17 were in an untrapped condition, the water contained being insufficient to seal the inlet. In the scullery, the bell portion of a 6-inch trap was found lying a little distance from the inlet, allowing a very strong current of sewer-air to escape into the room, and thence through a shaft opening, formed for ventilation, in the upper part of a window over the sink. This shaft again discharged it about two feet beneath an open window of a room which was in frequent use by the family. There were several water-closets and lavatory sinks on the upper floors, which were constantly untrapped by the action of the water-closets.

Again, at a gentleman's mansion at Hendon, there were 26 untrapped inlet sinks about the house, passages, and yards; of these, 12 were not sufficiently charged with water. On entering the dairy, the smell was almost intolerable, and this was caused by a dry bell-trap fixed over the drain, in one corner of the dairy floor.

---

[*] A lithographic sheet of diagrams, illustrating the system, will be issued with next week's *Journal*.

[†] Gully and drain traps on this system are made by Mr. Jennings, of Lambeth.

Then at a house in Duke-street, Manchester-square, a dry bell-trap was found immediately against an air-brick fixed in the front wall, and one also against an air-brick in the back wall. Openings were also found in the floor of the basement, in connection with the air bricks, through which the sewer air entered. The raised sink was also untrapped. Then, at the top of the house, a rain-pipe was observed within three feet of, and below, an open window belonging to a bedroom; the rain-pipe received the discharge from a water-closet on the top floor, and was in direct connection with the drain. A very strong current of sewer air was discharged through the top of the rain pipe, and passed by the window into the room. These cases are given to show the practical defects of the present system, and the author could mention, if it were necessary, a large number of other cases of a similar character.

In further considering the action of drain-traps, we will refer to a drain trapped at its outlet with a shackle-flap, and the several inlets trapped with the ordinary water-traps. When water is poured into a drain thus constructed, the result depends in a measure on the relative weight of the shackle-flap at the outlet as compared with the resisting power of the water-traps. If the flap be lighter, the pressure exerted on the air, contained in the drain by the in-flowing water, will act on the inner face of the flap, force it open, and discharge a bulk of air into the sewer. Then, while the water is passing through the lower part of the flap, the sewer-air will enter by the upper part, and thus the drain will be filled with sewer-air, even while the water-traps are full. If one of the inlet-traps were unsealed, the air would pass through the unsealed trap instead of into the sewer. If the shackle-flap be the stronger resistant of pressure, the water poured into the drain will act on the surface of the water in the weakest of the water-traps, and impart to it a rocking motion, causing part of it to flow out of its basin. The atmosphere will also press on it, in the endeavour to take the place of the out-flowing water, and thus untrap the inlet, so as to allow sewer-air to enter the upper part of the shackle-flap during the period of flow. Then, if the outlet-trap be a common syphon, or the old form of dip-trap (which in principle are both precisely the same), then the sewer air will be entirely shut off, but the force of displacement of the contained drain-air will most likely enter the house through the kitchen sink, as the air of the drains must escape somewhere, under the pressure of in-flowing water. Into such a drain, the more water there is thrown into it, the more effluvia will escape. The slimy coating also of the interior of a long length of drain, is of itself sufficient to contaminate the contained air, no matter what fall the drain may have. In the methods just described, the one idea has been an unsuccessful endeavour to stop the opening from which the smell escaped, without inquiring if this or that opening is stopped, what will become of the foul air, what new state of things is produced, and what are the influences actually at work. Certain it is that the mode generally adopted of trapping inlet-drains, favours the escape of sewer air into the houses.

Now, all that has been stated suggests that, in the trapping of drains, there must be provided—

1st. A ready and proper outlet for the escape of the drain-air when under pressure.

2nd. A means of supplying air to the drain, to follow the out-flowing water.

3rd. Such a construction of the inlet-traps as will effectually prevent the escape of drain-air.

The way in which these three principles may be applied is as follows:—The outlet-trap is fixed at or near the point where the drain is connected with the sewer, and is made in one piece, with a syphon dip, to shut off the sewer air, and an air exit-tube passing over the syphon dip. Then, at the mouth of the air-tube a light metal air-valve is placed, so as to open outwards from the tube into the sewer on receiving a light pressure from within. Thus, when water is discharged into the drain, or a decided difference of temperature exists, the pressure of the air is exerted on the inner face of the valve, which then opens, and allows the drain-air to pass into the sewer. The syphon dip, without the shackle flap, is admissible at the outlet of a ventilated drain, as it is always charged with water. Then, at the several inlets are fixed valves to work freely, with syphon dips behind them, excepting the water-closets and scullery-sinks. The valve shuts off the drain air whether there is water in the trap or not, and the syphon dip prevents the escape of drain-air, during the period of flow, through the upper part of the valve. No amount of pressure from within the drain, or atmospheric influence from without, can affect the efficiency of these traps. Next, in any part of the drain (near the extremity is best) is placed an air-supply post, containing a light air-supply valve, which opens inward to the drain on a light pressure so that when the water emptied into the drain (having first displaced air through the outlet air-valve) flows out of the drain, it is followed by a supply of air through the air-supply post. The more water discharged into the drain, the more frequent will be the removal of air. In the application of this principle to a drain having inlets at a considerable elevation, in lieu of the air-escape at the outlet traps, an air tube is carried from the highest point of the drain to a height as far as possible from the windows and the influence of chimney down-draught. The inlets are secured by the same mode as that just previously described, a common syphon at the outlet, and the air-supply valve fixed near the outlet of the drain. By this mode a current of air is obtained from the lower part, passing through the drain, and discharging above the roof. In many instances air supply is obtained freely through the valve sink-inlets.

In the case of a house-drain connecting into a pipe-sewer, in order to obtain a ready access to the air-valve and syphon-dip, the air-tube is continued on to the surface side of the dip, where it receives a box, containing the air exit-valve. The air-tube thence continues down to the outlet-side of the dip, and the air is discharged into the sewer.

The form of sink made for a garden-sink is adapted for yards, areas, stables, gardens, cellars, &c. A cheaper one for cottages is made in stoneware, with spigot-ends at the valve-mouth to fit the socket of an ordinary drain-pipe, and finished with a socket-flange at the top, to receive a perforated iron or stoneware plate; the workman laying the drain can thus complete his work without sending for the bricklayer, labourer, bricks, and cement, to form the receiver usually constructed beneath a bell-trap or 5-hole sink.

The form used for stables and large yard-surfaces is made wholly of iron. An iron nozzle-piece is attached to the outlet, forming a spigot-piece, and is made to fit into an ordinary socket-pipe.

Scullery sinks are very difficult things to secure, because of the rapid accumulation of grease. Valves are inadmissible, except in the form of a gully-trap and receiver, which are found to be safe and effectual. The pipe from the sink should, in that case, be continued so as to dip into the receiver. In small scullery-sinks a deep form of garden-sink, without the valve, would be much cheaper, and is found to be effectual. The valve is also unsuitable for a closet-inlet, as the paper clogs the valve, and the syphon-trap of the closet is never dry, and is not subject to variation in a ventilated drain.

A few words on the subject of water-closets. It is as well to state some objections to the form of closet in general use. The well known valve-closet, formed by a valve about two inches in diameter, closing at the lower part of the pan, is liable to leakage at the valve, and, when this occurs, the corrupted air contained in the iron chamber beneath escapes into the house.

A large number of copper and zinc pan closets are in use. We have first the stoneware basin, then a swing pan of copper or zinc, then a large iron pan beneath these, and this iron pan has a surface of metal coated with foul matter equal to 4¾ ft. and in contact with the external air. The common closet pan contains one-third of a foot super., but the most cleanly closet I have met with is one made by Mr. Jennings, which was in use at the last Great Exhibition, exposing a surface of 1⅛ ft. only in contact with the soil, giving off the least amount of effluvia. A common 7s. 6d. stoneware pan is preferable by far, in the matter of cleanliness, to many of those costly contrivances that are in daily use.

In conclusion, I hope the importance of this subject will be an excuse for the length of this paper.

DISCUSSION.

The Chairman said that the subject of the paper, although somewhat unsavoury, was really of vital importance, and none the less so that a great deal more attention was generally paid by engineers and others to the treatment of sewage itself than to the gases to which it gave rise. Mr. Lovegrove, however, had treated of air, which might be either man's best friend or one of his most dangerous foes, and had shown that it was not exempt from one of the conditions of humanity, inasmuch as it was exceedingly liable to be contaminated by evil communications. It had been shown that there were many schemes, of, he might almost say, diabolical ingenuity, for admitting to houses, under the guise of fresh air, that which really came from the immediate neighbourhood of the most corrupt materials, and that many of the sanitary improvements of recent times had led to evils before unknown. Great trouble and expense had been gone into in London in connection with a system of main drainage, which was the most magnificent, probably, in the world, but it must be borne in mind that the strength of a chain was only that of its weakest part, and while the main sewers were on so grand a scale, the system of house drainage was often radically defective. The appliances, therefore, which had been described by Mr. Lovegrove, for remedying these defects, were particularly valuable, if, as seemed to be the case, they were efficient. He thought that in the discussion the distinction should be borne in mind between the ventilation of the sewers and that of house drains. It was to the latter that Mr. Lovegrove's paper principally referred.

Dr. Alfred Carpenter, who had paid particular attention to the subject of the ventilation of drains for many years, could not agree with all the principles laid down by Mr. Lovegrove, because they seemed to go to the end of endeavours to keep in drains that which wanted to get out of them. The true principle of ventilating sewers was to let out everything, and abolish all traps in connection with houses, except those communicating with the waterclosets, which were necessary. His attention had been drawn to this subject through observing, as a medical man, the enormous amount of evil arising from the introduction of foul air into houses, and ultimately, he believed, he had been able to show how proper ventilation of sewers might take place, so as to leave the houses and drains perfectly safe, without any of the ingenious contrivances which had been displayed. Looking to nature as a guide, they found that in a tree or in an animal there were innumerable openings by which the foul gases which were generated were thrown out of the system. The true principle was to prevent the production in the sewers of the foul atmosphere, which was to be accomplished by keeping a continual current of fresh air running through them; and in this way, and this only, would they be safe, because, however perfect might be a system of traps, valves, as they knew, were always liable to get out of order, especially when they came in contact with the materials that passed through drains, and then there was an efflux of foul air. The principle he contended for was the prevention of foul air being formed in the sewers, by providing abundant openings for the admission of fresh air, by which the foul air would be oxidised or neutralised as soon as formed. There should be no communication between the house and the drain, except in the water closet, and the soil pipe should be carried up as straight as possible above the roof; there would then be no pressure on the water valve, nor any entry of foul air into the house. This principle had been carried out by a Local Board of Health, with which he was connected, within the last few years, and with the most perfect success. The openings from the sewers should, of course, be provided with charcoal to neutralise the foul air without any danger to the inhabitants in the neighbourhood. These openings might be placed at intervals of 50 or 100 yards, and by this means all stagnation of air in sewers would be prevented. The same principle was applicable to mines, where it was found necessary to keep up a constant current of air.

Mr. Varley was of opinion that too many outlets were made from the sewers; he believed that whatever quantity of air passed into the sewers would be contaminated before it came out again, and, therefore, the fewer openings the better. There must, however, be some escape, and for this purpose he proposed to have flues at certain intervals, conducted up to a height above the roofs of houses, and, where possible, in contiguity to a chimney where there was always a fire burning, so that the warmth might ensure an upward draught. The "commissioners' openings," as he termed them, in the crown of the sewers, should then be stopped up.

Mr. Campin said it had been proposed to ventilate sewers by means of ornamental iron lamp-posts, and this arrangement had been made in the new street in Southwark. He did not know whether or not the foul air would tend to put out the gas, but, if not, there would be a ready means of producing a draught by the same kind of action as that of the furnaces used for the ventilation of mines.

Dr. John Tripe said there could be no doubt that the best system of ventilating sewers so as to prevent injury to the public health was to let in as much fresh air as possible, and change it rapidly. Nothing would be better than the system proposed by Dr. Alfred Carpenter, if it could be carried out, but unfortunately this was not the case, and they must deal with matters as they actually were. Most persons would agree that if they were going to reconstruct the whole drainage system, there should be no direct communication between the sewers and the houses except the water closets; in fact, the surface-drainage should be altogether separated from the closet-drainage, and by this means small pipes would do instead of the enormous sewers now constructed; but this was not their position. Those who, like himself, were constantly engaged in sanitary work, and had to investigate the cause of the presence of foul air in dwellings, must be aware that, in a great majority of cases, the evil arose fom some defect in the traps, such as had been described in the paper; and there was no doubt that a vast improvement would be effected by the introduction of the syphon-trap or something similar in house-drains, particularly at the sink. When he took the house in which he now lived he was told that it was thoroughly trapped, but in a few days the stink was abominable, and, on examination, it was found that there was no syphon to the trap underneath the sink; one was put there, and the smell ceased immediately. This defect was very common in kitchens, and was the cause of an immense deal of mischief. He quite agreed that, if it were possible, all sink drainage should be carried off to an open yard, thus avoiding direct communication with the sewers; but this was impossible in the vast majority of houses in London and elsewhere, where the kitchens were below the ground level, and therefore it was necessary to adopt the best system of traps which could be devised. He had not seen anything to equal some of the plans which had been described that evening; and he could speak from his own practical experience that they answered the purpose for which they were intended.

Mr. BOTLY said he was not so conversant with the subject as to be able to judge of the superiority of one plan over another; but, from his own experience, he could illustrate the great importance of the question. Some years ago he was for some time honorary governor to an hospital in the West of England, in which there were four wards. One of these wards had been for many years subject to skin diseases and erysipelas, and at length a committee was appointed to investigate the matter. It was then found that the closet drains from nearly the whole building went along the wall of that particular ward; this was altered by the introduction of some such arrangement as had been described to them, and there was scarcely a case of erysipelas or cutaneous disease afterwards. It was often found to be the case that skin diseases were very prevalent in houses where the drainage was defective, and, therefore, too much attention could hardly be paid to the subject.

Mr. BALDWIN LATHAM remarked that the paper which they had heard was rather on appliances by which drains were trapped than on their ventilation. There could be no doubt that the secret of success of the water-closet system of town sewerage depended on the ventilation of drains and sewers, but much more mystery was made of this subject than necessary, many persons conceiving that it could not be carried out without some special appliances for furnishing fresh air, or exhausting the sewers of foul air, but no greater mistake could be made. From the very nature of sewage action there was a constant fluctuation in the supply and flow of matter through the sewers, which might be running at one period of the day three-quarters full, and at another only one quarter; and this fluctuation might be made the means by which perfect ventilation could be secured. Of course the augmentation of the flow caused a displacement of the air, for which an escape must be found somewhere, and, as the flow declined, fresh air would come in to supply its place; so that if this were only encouraged by making a sufficient number of openings, which must be supplied with ventilators for oxidising or deodorising the foul gases, a perfect system of ventilation would be secured. The general plan, on the contrary, had been to trap every possible opening into the sewer, and to lead the sewer to a point below the water-line of the river; this was just like draining into a bottle. If at one period of the day the sewer was nearly dry, and at another half full, the result would be a quantity of foul gas condensed to the extent of one atmosphere, which must find an outlet somewhere, and all the traps in the world would not prevent it. Mr. Lovegrove had shown one method by which the ordinary bell-trap would discharge itself, but there were several others. If, for instance, the housemaid poured a whole bucketful of water down the sink at once, it would act as a syphon of itself, and every drop of water would be drained off; and, again, it was a very common thing, if there were matters in the sink which would not readily pass away, to pull out the bell-trap altogether, and then there was a free communication with the drain at once. It had occurred to him, as the simplest method of guarding against these evils, that as the sink was generally placed against the external wall, the pipe might be carried through and allowed to discharge itself outside over an open grating fixed in the area, and then if there were any escape of gas from the sewer, it would be outside the house, and not within. Stand-pipes for the admission of fresh air had been recommended, but, as he had already stated, no forced supply was required; the air must enter the sewer without pressure. Wherever a valve was used there must be a certain amount of pressure before the air would take that direction, and he could not conceive what use it would be during certain periods of the day when the current would be outwards from the sewers, and any valve arranged merely for the admission of air would be simply inoperative. With regard to general principles, in laying down a correct system of drainage, they must begin at the beginning; when the water was flowing in one direction the gas would be flowing in another, and, therefore, the arrangement described by which the gas was to be made to go in the same direction as the water when there was a flush appeared contrary to natural laws. Any system of sewers ought to be broken up into short lengths, which should be disconnected as much as possible, so that the foul gas from one portion could not pass to another. Before a town was drained, the low-lying parts were always the most unhealthy, but after a system of sewers was constructed this condition of things was frequently reversed, and the higher parts became centres of disease; showing that by the system of impervious drainage, which was often adopted, the foul gases containing spores of disease were carried from one district to another. The ventilating openings in the middle of the streets had been much objected to, but they were not so injurious as the system recommended by Mr. Varley for carrying off the gas in close proximity to a chimney, for it often happened that there would be down currents in chimneys, which would thus draw in the foul air into the house. Foul air was rendered innocuous in two ways, by dilution, and by oxidation or destruction. The former took place when the gas escaped in the centre of the road, becoming of course more dilute every foot from the opening until it ceased to have any power for evil. The other plan, oxidation, when successful, was more complete and far preferable. Mr. Latham then exhibited a diagram, showing a new construction of charcoal basket for this purpose; around the charcoal chamber was a deep receptacle for the rain or falling water, communicating with the sewer by an overflow outlet below the level of the charcoal, which was thus kept constantly dry; in the centre, under the charcoal and communicating with it, was a spiral chamber, up which the gas ascended. He might mention, in conclusion, with regard to the town of Croydon, to which Dr. Alfred Carpenter had alluded, that when the sewerage system was first constructed, a few ventilating holes which were made were soon stopped up because of the stink which arose from them, but the result was that the town at particular periods became subject to attacks of low fever, which did not, however, appear in the low, but in the high-lying districts. It occurred to him that this was due to a lack of sewer ventilation, and in order to test it, when one of these epidemics was rife he took a long line of road, and instead of beginning to ventilate at the upper end, as he should have done if his object had been to do the work quickly, he began at the lower end and worked upwards. The result was, that as ventilation went on in that road, there was not a single fresh case of fever, and the patients began to improve rapidly; above the point of ventilation there were still fresh cases, and so it went on until the whole road was ventilated, and then the fever disappeared.

Mr. GLASS did not consider trapping necessary, if drains were properly ventilated. If there were no traps there would be a constant influx of fresh air into the drains, and thence into the sewers, and there would be no nuisance whatever, provided there were a sufficient number of ventilating shafts to the sewers. The plan of carrying pipes up the sides of houses was never really effectual; the proper method was to have special shafts with disinfecting agents.

Mr. EDWARD R. COOK said the discussion seemed to have wandered from the ventilation of drains to that of sewers, both being highly important; but the paper had dealt rather with the former. One important point which Mr. Lovegrove had seized seemed to be this, that whenever there was a current of water down the feed pipe of a house drain, there would be a draught of air back again from the drain; and, therefore, it was necessary to provide against the water which lay in syphon or bell-traps being accidentally drawn off. He could not help thinking that the plan which had been shown for carrying the foul air through the drain by the rush of water was, at any rate, a step in the right direction. He could not agree with all that had been said as to the free ventilation of drains. If nothing were requisite but free access of fresh air, then an open ditch would be the best drain they could have, which was evidently not the case. If an open ditch were offensive, so, and much more so, must be a brick sewer, which at one time would have in it three feet of sewage and at another only one. There were there present the three essentials to putrefaction, damp, heat, and air, and the generation of impure gas must consequently go on very rapidly. He hoped that by the attention of scientific men being called to the matter some means might be devised for preventing the generation of these gases, or for neutralising them before they reached the atmosphere, for he could not think that their mere dilution by admixture with a large quantity of air was the proper method of treating them.

Mr. JAMES MARR said the question before them was one of immense importance, for the returns of the Registrar-General showed that a large proportion of the deaths in London, especially those in crowded courts and alleys, arose from the constant breathing of impure air coming from ill-ventilated sewers. The Board of Works, the local boards, and vestries, all had most extensive powers, which were generally very properly exercised; no one could build a house, lay out a street, or construct a sewer, without their approbation; and one of their powers was to stop up or cover over any offensive drain, water-course, or pond, and to require the removal of all offensive matters. The 71st section of the Metropolis Local Management Act was to this effect:—"Every district board or vestry shall, by providing proper traps or other coverings, or by ventilators, or by such other means as shall be practicable for that purpose, prevent the effluvia of sewers from exhaling through the gullyholes, gratings, or other openings of the sewers in any of the streets or other places within their district or parish." Now, the way in which sewers were commonly ventilated was by having openings in the middle of the streets, and by allowing the man-holes in various places to remain open for several hours at a time, and also by means of untrapped gullyholes, which ought to be hermetically sealed. In his opinion the Board of Works should compel every builder to construct a ventilating shaft, direct from the drain, leading from each large house, or in the case of small houses, one to every ten or twelve. This shaft might be carried up inside the wall of the house close to the flues, and taken to the height of some feet above the chimnies. This would only apply to new houses, but those already built might be treated in much the same way, only the pipe would have to be carried up externally. He could not condemn the system of trapping, because in many instances it was found to do its work well, but he at the same time agreed with Dr. Alfred Carpenter that a thorough system of ventilation would obviate the necessity for such appliances.

Mr. FORD regretted that the question had been limited to the ventilation of drains, as he considered the ventilation of sewers was the first and most important consideration, but he could not let the discussion close without bearing his testimony to the evils of the bell-trap system, which had been so well pointed out by Mr. Lovegrove. He recently, in company with a sanitary inspector, visited sixty houses in one parish, in forty-nine of which the traps were uncovered. This was the great evil, that the tenants would constantly uncover them, and consequently they were of no service at all. It would be much better, therefore, in his opinion, to abolish bell-traps, and go back to the old-fashioned plan of a deep trap, because when that got choked with silt, the water would not run off, and it was obliged to be cleared out.

Mr. JAMES did not think the plan recommended by Mr. Latham, of carrying the pipe from the sink into the open air, would be a good one, as the bad smell would pass up the open pipe into the kitchen, and thence through the house.

Mr. LOVEGROVE, in reply, said that the proposal of Dr. Alfred Carpenter, to abolish all traps, would in the present state of things be, in his opinion, a most suicidal policy; they were everywhere in use, which was a sufficient proof that they had their work to do, and it was, therefore, important to see that they did it properly. The next speaker rather supported the same view, but as his own experience showed the evil consequences of badly-trapped drains, he need not enlarge further on the result of abolishing such appliances. Mr. Latham had made some valuable observations on the subject of ventilating sewers, which, no doubt, was one of the most important questions of the day. It was quite a distinct matter from that of the ventilation of the drains which connected the house with the sewers, and this latter was, in reality, the more important, since the total length of drains in London was probably equal to ten times that of the sewers, and they were in immediate connection with the house. He could not conceive of such a state of things as would admit of doing without traps at all. He had heard it suggested that such a fall might be given to the drain that all sewage matter would pass off so rapidly that no smell would arise, but still there would be a large surface which would soon become coated with slimy matter, which would contaminate the air. There were two systems recommended for ventilating house drains, one being an outlet trap with a water current, which had been stigmatised by Mr. Latham as opposed to natural laws. He could only say that notwithstanding these supposed natural laws, he had found the air escape that way, having tested it over and over again, both by the anemometer, and by the flame of a candle, and he had found the current of air as frequently passing in a contrary direction to the stream of water as with it. He believed the stream had nothing to do with the direction of the air currents. The fluctuation in the flow of sewage was no doubt a most important element of power in the ventilation of sewers, as he had suggested some 16 years ago to the Commissioners of Sewers. The same thing might also be utilised in the ventilation of house drains, which were but small sewers. The other system was to have outlets for the foul air at a considerable elevation. He saw no reason why both methods should not be adopted. With regard to the ventilation of sewers, he had had it under his attention for a long time, and now had a considerable length under experiment upon the principles shadowed forth in the paper he had read, the results of which, at some future time, he hoped to be able to communicate. In answer to a question, Mr. Lovegrove added that the distinction in legal phraseology between a sewer and a drain, was that the latter conveyed sewage from one house only, anything which was connected with two or more houses being denominated a sewer. He, however, regarded everything as a drain which passed under a house and emptied into the sewer in the street, whether it conveyed the refuse from one house or more.

The CHAIRMAN, in moving a vote of thanks to Mr. Lovegrove for his able paper, said the discussion had somewhat wandered, though it was very difficult to separate the ventilation of drains from that of sewers. Everyone, however, seemed to concur that abundant openings ought to be provided, with suitable apparatus for oxidising the foul air. There was some difference of opinion as to the best mode of doing this, and he was not sufficiently well acquainted with the subject to decide the question, but it was very gratifying to find so many able men turning their attention to the matter, and he did not doubt that before long a satisfactory conclusion would be arrived at.

The vote of thanks was then passed and acknowledged.

The paper was illustrated by a large number of diagrams and models.

THE AMSTERDAM EXHIBITION.

The Sub-Committee met on Monday, the 10th inst., at the house of the Society of Arts, to consider the question of applications for space from intending exhibitors. As these have now become very numerous, and the principal British trades and industries are likely to be well represented by important houses, the Committee have felt warranted in applying for an extension of space, which has been granted by the Central Committee at the Hague. The municipal authorities of Amsterdam have also placed at the disposal of the Exhibition Committee a square in front of the Palace, where booths or stalls will be erected for those desirous of effecting sales, which cannot be carried on in the building. This affords an opportunity of exhibiting and obtaining orders for many kinds of articles not coming strictly within the scope of the Exhibition. Parties desirous of renting these stalls or booths, which are 16 yards square, should make immediate application to Mr. P. L. Simmonds, the London Secretary, 3, Castle-street, Holborn.

Every arrangement has been made by the Mansion-house Committee and the various consuls, &c., for the Netherlands at the shipping ports to facilitate transport, reduce expense, and relieve British exhibitors from all trouble. A fund has been set on foot to defray the contingent expenses of publicity, printing, correspondence, &c., to which the following sums have already been contributed:—

	£	s.	d.
The Right Hon. the Lord Mayor ..	10	10	0
The Society of Arts..	25	0	0
Samuel Morley, Esq., M.P.	25	0	0
Thos. Baring, Esq., M.P.	10	0	0
G. D. Wingfield Digby, Esq... ..	10	0	0
Baron Gevers	5	0	0
D. Everwyn, Esq.	5	0	0
J. W. May, Esq.	5	0	0
T. Twining, Esq.	5	0	0
W. R. Sandbach, Esq.	5	0	0
Messrs. F. H. and A. Collier	5	5	0
Messrs. J. M. Johnson and Sons ..	5	5	0
Hodgson Pratt, Esq.	2	2	0

Further subscriptions to this fund are invited, and should be sent to the Treasurers, S. Redgrave, Esq., and Seymour Teulon, Esq., Society of Arts.

Fine Arts.

EXHIBITION AT BORDEAUX.—The Bordeaux Exhibition of Works of Art, which opened in the latter part of March, contains the large number of 645 pictures, many of them by Parisian and other artists of high reputation. Provincial exhibitions are assuming an importance which scarcely any one would have predicted for them a dozen years since. A considerable number of artists exhibiting at Bordeaux are medallists of the Paris Salon.

Manufactures.

DISTILLERIES IN HOLLAND.—This industry, formerly so flourishing, suffered a good deal from the civil war in America. The annual export of Hollands, called Schiedam, varies from 70,000 to 80,000 hectolitres. The principal distilleries of Geneva are situate in the province of South Holland, where there are 328, employing about 2,000 workmen. The town of Schiedam alone has 226, with 600 to 800 workmen. These employ steam-power. The towns of Delft, Gonda, Rotterdam, and Lingden have also distilleries, but of less importance. At Delftshaven, near Rotterdam, there are 36 distilleries, which ship 26,000 hectolitres. The 25 distilleries of liqueurs in Amsterdam produce annually 1½ million litres. In all the other provinces there are small distilleries to supply the local wants. There are besides, at Nimeguen, and at Voorburg, near the Hague, two perfume distilleries.

Colonies.

MINING IN SOUTH AUSTRALIA.—The mining interest in this colony has commenced the year with revived energy. The gold fields and silver mines are still the subject of eager interest. Nothing yet discovered has been sufficient to justify the belief that the fields of this colony will bear comparison with the most celebrated gold-producing countries; still, the quantity obtained is sufficiently encouraging to induce the miners to go forward with confidence.

EMIGRATION FROM SYDNEY, NEW SOUTH WALES, TO SAN FRANCISCO.—Some time since, when work was slack in the colony, about 1,300 men were *tempted by the* expectation of high wages to emigrate to San Francisco. Some of the journals there quoted very high rates of wages, and stated that the railway works were being pushed on with an energy that made it impossible for anyone willing to work to remain without employment, but much disappointment in this respect has been experienced.

Correspondence.

COLONEL MAUDE'S PAPER.—SIR,—I find in your *Journal* of yesterday an important error in the report of my speech in the discussion on Colonel Maude's paper. At page 466, at the top of the second column, in the third line, instead of "taking the yield at only 20 lbs. an acre, that gave a result of 400 lbs. of cotton per family," the words should be, "taking the lowest estimate, twenty acres (per family), averaging 400 lbs. of cotton per acre."—I am, &c., THOMAS BRIGGS.

The Homestead, Richmond, S.W., May 8th, 1869.

MEETINGS FOR THE ENSUING WEEK.

MON......Victoria Inst., 8.
TUES ...Statistical, 8. Mr. Samuel Brown, "On the Statistics of the Netherlands."
Royal Inst., 3. Prof. Grant, "Astronomy."
Pathological, 8.
Anthropological, 8.
WED ...Society of Arts, 8. Mr. John Robinson, "On the Progress of the Colonies."
Pharmaceutical, 11. Annual Meeting.
R. Society of Literature, 8½.
THUR ...Royal Inst., 3. Prof. Tyndall, "On Light."
Zoological, 4.
London Inst., 6.
Chemical, 8.
Numismatic, 7.
Aëronautical, 8.
FRI ......Philological, 8. Annual Meeting.
Royal Inst., 8. Prof. Fleeming Jenkin, "Submersion and Recovery of Submarine Cables."
SAT ......R. Botanic, 3¾.
Royal Inst., 3. Prof. Seeley, "Roman History.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 1st May*, 1869.

99. Bill—Pharmacy Act (1868) Amendment—Amended.
104. Joint-Stock Companies—Return.
106. (I.) Mail Contracts - Index to Report.
151. Harbours of Refuge—Letter.
Public Petitions—Seventeenth Report.

SESSION 1868.

344. (A. IX.) Poor Rates and Pauperism—Return (A).

Delivered on 3rd May, 1869.

173. Volunteer Reviews (Manchester, &c., 1868)—Reports.
175. Metropolitan Workhouses—Return.

Delivered on 4th May, 1869.

99. Bill—Pharmacy Act Amendment (1868) (amended)—Corrected copy.
101. ,, Stannaries (amended).
140. East India (Staff Corps, &c.)—Correspondence.
171. Assessed Taxes and License Duties—Return.

Delivered on 5th May, 1869.

102. Bill—Sheriffs (York County).
104. ,, Norfolk Island Bishopric.
2. (7.) Railways Abandonment—Report of the Board of Trade.
120. Election Petitions—Copy of the Shorthand Writers' Notes of the Judgments delivered by the Judges.
176. Evesham Union (Orphans)—Return.
Public Petitions—Eighteenth Report.

Delivered on 6th May, 1869.

105. Bill—Greenwich Hospital.
108. ,, O'Sullivan's Disability.
163. Greenwich Hospital—Account.
169. Wisley Common - Report, Evidence, &c.
174. Light Dues—Memorials.

Delivered on 7th May, 1869.

107. Bill—Recorders' Deputies.
181. Postal Conventions (England and America)—Correspondence.

SESSION 1868.

344. (A. X.) Poor Rates and Pauperism—Return (A).

Delivered on 8th May, 1869.

103. Bill—Contagious Diseases (Animals) (No. 2) (amended).
110. ,, Endowed Hospitals, &c. (Scotland) (amended.)
111. ,, Park-gate Chapel Marriages, &c.
136. Poor Law (Ireland)—Return.
182. Ecclesiastical Commission—Report.
183. Government Insurances and Annuities—Accounts.
Public Petitions—Nineteenth Report.

Second Delivery.

112. Bill—Irish Church (amended).

Delivered on 10th May, 1869.

81. (II.) Railway and Canal Bills—Third Report.
112. Superannuations (Public Offices)—Account.
187. Ramsgate Harbour—Statement.
190. Mails (United States)—Return.
193. Temporary Laws—Register.
194. Education (Ireland)—Return.
199. Civil Services—Estimate, "On Account."

Patents.

◆

From Commissioners of Patents' Journal, May 7.

GRANTS OF PROVISIONAL PROTECTION.

Anchors—1289—R. Sterne.
Animal and vegetable matters, drying—1207—R. J. Ellis and C. L. W. Fitz-Gerald.
Armour-plated structures, screw bolts, &c., for—1247—W. Palliser and T. English.
Bobbins, winding yarns or threads on—1308—G. Heyes & E. Barlow.
Boilers—1291—G. Hawxhurst and J. Pollock.
Boilers, apparatus for preventing the bursting of—1255—H. E. Newton.
Bolts—999—W. Marston.
Boots and shoes—1302—T. Aspden and E. H. Lambert.
Boots and shoes, applying elastic fabrics in the manufacture of—1314—T. Bostock.
Carding engines—1235—G. Dania and J., T., R., and S. Stott.
Carding engines—1295—B. Dobson.
Carding machinery—1267—S. Brooke.
Carriage wheels—1300—R. Marshall.
Cartridges—1257—T. Wilson.
Cask spiles—1271—D. A. S. Mackintosh.
Cask stands or tilts—1309—N. Voice.
Corks, &c., machinery for cutting—1268—J. Crabtree.
Crushing and pulverising machines—1265—R. Foster.
Excreta, collecting and treating—982—J. C. Lee.
Fires, extinguishing 1253—W. B. Dick.
Fish, apparatus for keeping alive for market—1276—O. Engholm.
Food, preserving articles of—1275—O. Engholm.
Furnaces—1285—J. K. Broadbent and S. and J. Prestwich.
Fusees, &c.—1297—J. Cane.
Gas furnaces, generating gas to be used in—1316—J. Frölich.
Graining in oil colours—1320—H. Bray and H. Adams.
Harrows—1266—J. Heal.
Harrows or drags—1241 - M. Hillary.
Hats, ventilating—1313—E. Cooper.
Hats, &c., ventilating—1306—I. J. J. Lewis.
India-rubber, &c., compounds containing—1278—T. Forster and P. B. Cow, jun.
Iron and steel—1317—A. Meredith.
Iron, puddling—1256—H. E. Newton.
Knitting machines—1292—W. Prowett.
Lavatories, &c.—1196—W. H. Smith, jun.
Locks—1293—W. R. Lake.
Lubricators—1218—J. Fletcher, sen., J. Fletcher, jun., and W. Fletcher.
Motive-power engines, &c.—1169—J. H. Johnson.
Motive-power machinery—1274—J. Cudbird.
Motive-power, obtaining—1284—H. Hall.
Motive-power, producing—1159—C. E. Brooman.
Nuts and bolts—1294—J. P. Cooper.
Oil-expressing apparatus—1139—M. Samuelson and C, Eskrett.
Ovens—1301—H. W. Hart.
Parasols—1287—A. V. Newton.
Percolators—1307—J. B. Kroll and A. Froment.
Pianofortes, &c.—1319—W. E. Gedge.
Pneumatic machinery—1303—J. H. Simpson.
Railway carriages, radiating the axles of—1322—M. Wilkin and J. Clark.
Railway carriages, &c., axle and axle-box for—1252—S. Smith.
Railway carriages, &c., axle-boxes for—1279—W. R. Lake.
Railway engines, &c., self-couplers for—863—T. Carrodus.
Railway signals—1286—J. Smith.
Reaping and mowing machines—1272—A. Jack.
Reaping and mowing machines—1273—A. Clark.
Saws for cutting slate, &c.—1107—J. Parry and R. Morris.
Screwing bolts, &c., stocks and dies for—1263—A. Muir.
Sheep-washing apparatus—1251—G. T. Bousfield.
Ship-weirs or moveable dams—1238—G. White.
Shirt studs and solitaires—1264—J. and B. Weigel.
Smoking pipes—1304—O. Moseley.
Slashers, apparatus for lessing warps in machines called—1237—J Eccles.
Sleeve links, &c.—1282—A. Watson.
Steam cultivators—1318—D. Greig, R. Burton, J. Gozney, and T. Atkinson.
Steam engines—1324—O. Rose.
Steam generators and condensers—1288—W. E. Newton.
Steam generators and condensers—1321—W. R. Lake.
Tables, &c.—1312—L. Isaac.
Tobacco, twisting—1175—R. Legg.
Tow, apparatus for carding—1280—G. White.
Toys—1213—W. R. Lake.
Velocipedes—1248—N. Wilson.
Velocipedes—1269—C. D. Abel.
Velocipedes—1281—I. Farrell and W. Turner.
Vessels, rigging square-rigged—1315—R. B. Forbes.
Voltaic batteries—1250—W. A. Lyttle.
Warp machines—1258—E. Tatham.
Wheels, machines for moulding—1254—J. Whittaker.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Bottle envelopes—1332—F. Bujeaud.
Heated water used for bathing, concentrating the caloric of—1310—H. A. Bonneville.

PATENTS SEALED.

3073. J. Barcroft.
3405. T. Rose and R. E. Gibson.
3408. G. Clark.
3411. J. H. Wilson.
3418. T. R. Crampton.
3420. T. Vaughan & E. Watteeu.
3427. F. Holmes.
3445. W. Thomas.
3471. H. Aitken.
3482. E. Hogg.
3487. S. W. Campain.
3527. A. Leykauf.
3533. G. Eguillon.
3718. A. Homfray.
3725. T. Kennan.
3951. H. Yorath.
3979. W. R. Lake.
595. W. R. Lake.
641. F. A. Gatty.
759. W. R. Lake.

From Commissioners of Patents' Journal, May 11.

PATENTS SEALED.

3441. W. Donisthorpe.
3442. G. P. White.
3443. J. Kellow.
3447. J. Dendy & J. H. W. Biggs.
3454. R. A. Gold.
3457. C. Jones.
3462. P. Hill.
3464. R. Beckley and J. J. Hicks.
3467. W. Richardson.
3484. A. McNeil & W. Wheaton.
3485. R. M. Boniwell.
3488. J. Jones and S. P. Bidder, jun.
3501. C. W. Siemens.
3504. F. O. Ward, W. Ibotson, and A. G. Southby.
3517. W. Avery and A. Fenton.
3525. D. Burns.
3526. A. Guthrie.
3563. W. H. Dreaper.
3571. T. Prideaux.
3658. J. H. Johnson.
3662. P. Ellis.
3663. P. Ellis.
3699. J. R. Swann.
3906. J. H. Johnson.
3939. W. H. Ridgway and F. W Walker.
3985. G. M. Wells.
187. H. A. Bonneville.
518. E. Hewett.
803. L. Engel.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1263. A. T. Becks.
1264. H. and J. Douglas.
1281. J. Marsh.
1282. G. Davies.
1291. H. K. York.
1317. J. R. Swann.
1352. J. M. Hart.
1350. W. Prosser.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1321. J. and T. Mellodew and C. W. Kesselmeyer.
1337. J. Roscoe.
1342. B. Cooke.
1360. P H. Colomb.
1376. W. Riddle.